The American Journal of Surgery

EDITED BY THURSTON SCOTT WELTON, M.D.

Gynecology

Vascular Surgery

Obstetrics · Proctology

Plastic Surgery · Abdominal Surgery

Intestinal Surgery · Orthopedic Surgery

FIFTY-SIXTH YEAR OF CONTINUOUS PUBLICATION

August 1947

VOLUME LXXIV NUMBER 2

EDITORIAL BOARD

The American Journal of Surgery

Editor THURSTON SCOTT WELTON, *New York*

ASSOCIATE EDITORS

CARL BECK, *Chicago*
CLAUDE S. BECK, *Cleveland*
GEORGE R. BRIGHTON, *New York*
MEREDITH F. CAMPBELL, *New York*
JAMES T. CASE, *Chicago*
ISIDORE COHN, *New Orleans*
BRADLEY L. COLEY, *New York*
FREDERICK A. COLLER, *Ann Arbor*
PAUL C. COLONNA, *Philadelphia*
ELLIOTT C. CUTLER, *Boston*
CHARLES A. ELSBERG, *New York*
GORDON S. FAHRNI, *Winnipeg*
HERBERT C. FETT, *Brooklyn*
EMIL GOETSCH, *Brooklyn*
CHARLES A. GORDON, *Brooklyn*
DONALD GUTHRIE, *Sayre, Pa.*
LOUIS J. HIRSCHMAN, *Detroit*
JAMES M. HITZROT, *New York*
EMILE F. HOLMAN, *San Francisco*
CLAUDE J. HUNT, *Kansas City, Mo.*
ARNOLD S. JACKSON, *Madison, Wis.*
WILLIAM L. KELLER, *Washington*
THOMAS J. KIRWIN, *New York*
ARTHUR KRIDA, *New York*
New York, ADRAIN V. S. LAMBERT
Los Angeles, E. ERIC LARSON
New York, MAURICE LENZ
New York, JEROME M. LYNCH
New Orleans, URBAN MAES
Newark, HARRISON S. MARTLAND
New Orleans, RUDOLPH MATAS
Detroit, ROY D. MCCLURE
Toronto, D. W. GORDON MURRAY
San Francisco, H. C. NAFFZIGER
Baltimore, EMIL NOVAK
Newark, CLARENCE R. O'CROWLEY
Boston, LOUIS E. PHANEUF
New York, EUGENE H. POOL
Rochester, Minn., JAMES T. PRIESTLEY
New York, DOUGLAS QUICK
Brooklyn, NATHANIEL P. RATHBUN
Raleigh, HUBERT A. ROYSTER
Philadelphia, HENRY S. RUTH
Memphis, ROBERT L. SANDERS
St. Louis, M. G. SEELIG
New York, J. BENTLEY SQUIER
New York, H. J. STANDER
Baltimore, GRANT E. WARD
San Francisco, J. HOMER WOOLSEY

The American Journal of Surgery is published monthly by The Yorke Publishing Co., Inc., 49 West 45th Street, New York 19, N. Y. Yearly Subscription, $10.00 U. S. A.; $12.00 Canada; $12.00 Foreign. Single Numbers $2.00; Special Numbers $4.00. Entered as second class matter August 28, 1926, at the Post Office, New York, N. Y., and on August 28, 1926, at York, Pa., under the act of March 3, 1879. August, 1947—New Series, Volume LXXIV, No. 2. *Copyright, 1947, by The Yorke Publishing Co., Inc.*

FROM AN ORIGINAL ETCHING BY ERNEST D. ROTH

The Medical College, Tulane University
at New Orleans, Louisiana, is the oldest medical school in the Southwest. Organized in 1834, its founding predates that of the University itself, of which it became a part in 1845. Tulane has made outstanding contributions to medical progress and public health through its advanced studies in tropical diseases and the development of controls for hookworm and malaria.

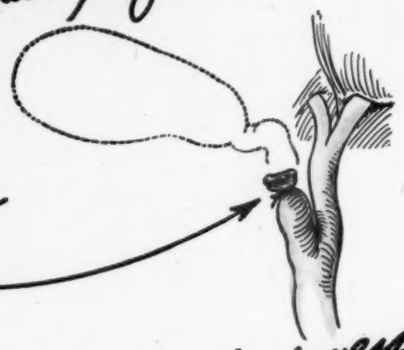
A sense of responsibility is an outstanding characteristic of those who follow the profession of surgery. Serving the profession for thirty-eight years, Davis & Geck, Inc. shares this sense of responsibility. This is evident not only in the rigid standards of suture quality set by D&G but also in the increasing variety of suture types and materials developed by D&G.

SUTUREGRAM

NUMBER THREE IN A SERIES

Ligation and Transfixion

Ligation prevents hemorrhage from large blood vessels and leakage from tubular structures.



Example: cystic duct

Ligature may slip off end of vessel if not tied tightly, particularly with extreme distention of the tube behind it.

Slipping can be prevented by tying ligature tightly, but then necrosis and secondary hemorrhage may result.

necrosis here

SUTUREGRAM

NUMBER THREE (CONTINUED)

Transfixion eliminates slipping, and tight tying becomes unnecessary, secondary hemorrhage is therefore prevented. Ligatures placed on blood vessels of any size and on the cystic duct should always be transfixed.

Two methods of Transfixion

(A) with single ligature

correct

transfixion beyond ligature

transfixion behind ligature

(B) with two ligatures

Best

ordinary ligature proximal

transfixed ligature distal

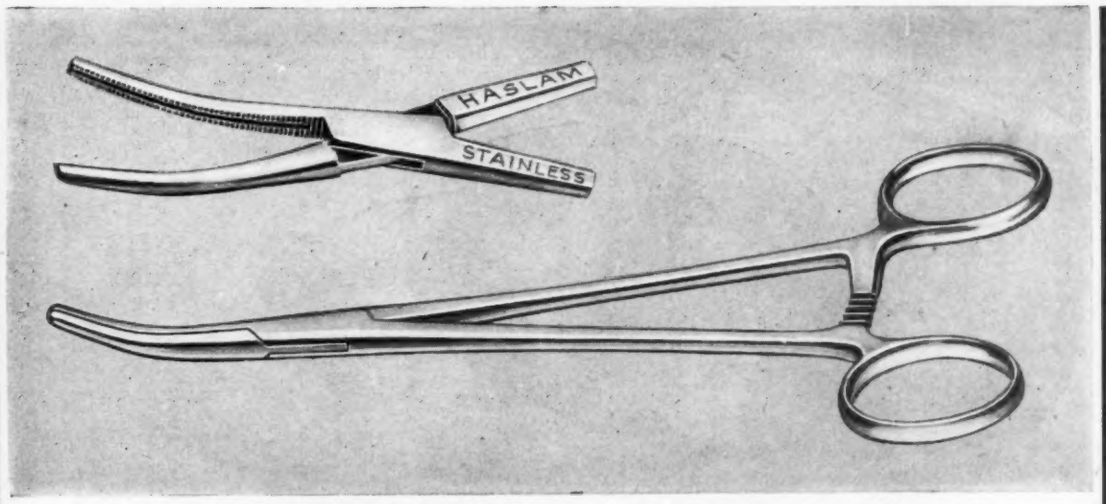
D&G DERMALON and SURGILON

Dermalon Sutures are processed monofilament nylon strands, providing absolute impermeability, desired degree of elasticity, and smoothness of surface.*

Surgilon Sutures are braided nylon, specially processed for maximal knot security, non-capillarity and compatibility.*

DERMALON & SURGILON SUTURES may be obtained with swaged-on Atraumatic* needles. *Reg. Trade-mark

DAVIS & GECK, INC.
BROOKLYN 1, NEW YORK



99 Years of HASLAM
Craftsmanship!

Haslam Instruments will be on display 33rd Annual Clinical Congress, American College of Surgeons, Waldorf-Astoria Hotel, Sept. 8-12, 47.

BUIE PILE CLAMP
Stainless Steel

Tongue in one blade fits into groove of other, assuring firm hold. 8¾ Inches long.

Ask your Surgical Supply Dealer for **HASLAM No. B-198-R**

EST 1848 Haslam

FRED. HASLAM & CO., INC.
Manufacturers of FINE SURGICAL INSTRUMENTS
83 PULASKI STREET BROOKLYN 6 NEW YORK

The American Journal of Surgery

VOL. LXXIV *Contents • August, 1947* NUMBER TWO

Editorial

Operations on the Vagus Nerves in the Treatment of Peptic Ulcer . . . . *Conrad R. Lam* 115

Original Articles

Fat Necrosis of the Female Breast. Report of One Hundred Ten Cases . . . . . *Frank E. Adair and Jean Thompson Munzer* 117

Experiences with Bone Grafting Procedures for the Treatment of Battle Casualties and War Injuries . . . . . *Lieut. Col. Byron B. King* 129

Contents Continued on Page 3

Preoperative Calm and *Postoperative* Comfort

PREOPERATIVE apprehension and excitation are readily reduced with Demerol, the potent analgesic, spasmolytic and sedative. In addition to psychic sedation, Demerol facilitates the induction of anesthesia, reduces the amount of anesthetic required, and effectively dries secretions. Compared with morphine, it entails practically no risk of respiratory depression and causes considerably less nausea and vomiting.

POSTOPERATIVE comfort is reliably obtained without interference with the cough reflex or bowel movements and with little danger of urinary retention. Patients in all age groups, regardless of the type of surgery or severity of pain, respond favorably to the drug. Ampuls (2 cc., 100 mg.); vials (30 cc., 50 mg./cc.); tablets (50 mg.); powder (15 Gm.) for prescription purposes. Council Accepted

DEMEROL HYDROCHLORIDE

Brand of meperidine hydrochloride (isonipecaine)

Warning: May be habit forming. Narcotic blank required.

WRITE FOR DETAILED LITERATURE

Winthrop CHEMICAL COMPANY, INC.

NEW YORK 13, N. Y. • WINDSOR, ONT.

DEMEROL, trademark Reg. U. S. Pat. Off. & Canada

The American Journal of Surgery

Reg. U. S. Pat. Off., Nov. 3, 1936

VOL. LXXIV — NUMBER TWO

Contents • August, 1947

Treatment of Large Ventral Incisional Hernia . . . . . *Herman A. Pink* 136

Prevention of Repeated Miscarriage . . . . . *Lawrence Kurzrok and Charles Birnberg* 143

Art in the Nasal Plastic Operation. From the Point of View of the Rhinologist . *Louis M. Pearlman* 150

Closure of Colostomies and Fistulas of the Large Bowel . . . . . *Lieut. Col. Charles S. Hertz and Col. D. Henry Poer* 163

Primary Lymphosarcoma of the Stomach. Statistical Summary and Case Report of a Five-year Cure . . . . . *John B. O'Donoghue and Maurice B. Jacobs* 174

Late Results in Surgery for Decubitus Ulcers . . . . . *Major Donald E. Barker* 180

Combination of Sulfanilamide and 9-Aminoacridine as a Surgical Antiseptic . . *S. Dale Spotts* 183

Prevention of Adhesions in the Right Colonic Gutter Following Right Colonic Resections . . . . . *Carl Y. Werelius* 187

Use of Adrenalin to Prolong Spinal Analgesia . . . . *Sylvan M. Shane and Eduardo T. Ruiz* 189

Observations on Early Postoperative Rising . . . . . *Thomas F. Keyes* 192

Case Reports

Pylephlebitis and Pyogenic Liver Abscess . . . . . *Charles J. McGee, Walter S. Priest and Arnold Schimberg* 194

Treatment of Chronic Salpingitis with Benzyl Cinnamate Ester (Jacobson's Solution) . . . . . *Morris I. Eisenstein and George J. Bendo* 200

Mediastinal Tumor . . . . . *Jacob K. Berman, J. Paxton Powell and Philip C. Hennessee* 205

Mesenteric Vascular Occlusion Complicating Thrombo-angiitis Obliterans . *Eugene J. Garvin* 211

Infected Burns . . . . . *Major Harold Cunningham Smith* 216

Villonodular Plasma Cell Synovitis . . . . . *Leo F. Bleyer and K. Carroll* 222

Enteric Cyst . . . . . *Victor E. Tedesco and John H. Connell* 226

Successful Operation for Imperforate Anus and Imperforate Rectum. Three Year Follow-up Report . . . . . *Joseph Liburt* 228

General Information on Page 4 · *Advertising Index on 3rd cover*

General Information

THE AMERICAN JOURNAL OF SURGERY does not hold itself responsible for any statements made or opinions expressed by any contributor in any article published in its columns.

Articles are accepted for publication with the understanding that they are original contributions never previously published. All manuscripts are subject to editorial modification, and upon acceptance become the property of THE AMERICAN JOURNAL OF SURGERY.

A reasonable number of illustrations are supplied free of cost; special arrangements must be made with the editor and publishers for excess illustrations and elaborate tables.

Reprints are furnished on order. Prices are quoted when articles are in page form.

Material published in THE AMERICAN JOURNAL OF SURGERY is copyrighted and may not be reproduced without permission of the publishers.

Change of address must reach us by the 15th of the month preceding month of issue.

PREPARATION OF MANUSCRIPTS

Text. Manuscripts are to be typewritten, on one side of the paper, with double spacing and good margins. The original should be sent to the editor and a carbon copy retained by the author.

Illustrations. Illustrations must be in the form of glossy prints or drawings in black ink (*never* in blue). On the back of each illustration the figure number, author's name and an indication of the top of the picture should be given. Legends for illustrations are to be typewritten in a single list, with numbers corresponding to those on the photographs and drawings. Please do not attach legends to the pictures themselves.

Bibliographies. Bibliographic references should be at the end of the manuscript and not in footnotes. Each reference should include the following information in the order indicated: Name of author with initials; title of article; name of periodical; volume, page and year. The following may be used as a model:

PHANEUF, LOUIS E. Indications and technique. *Am. J. Surg.*, 25: 446, 1937.

The author should always place his full address on his manuscript.

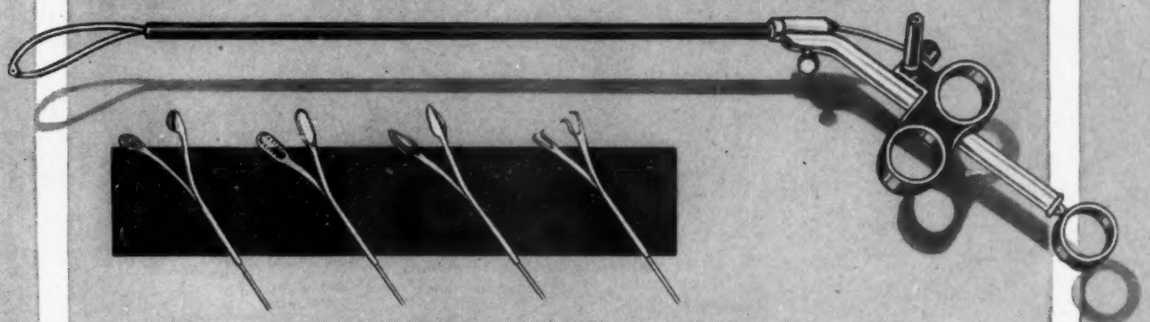
The subscription price of THE AMERICAN JOURNAL OF SURGERY, is $10.00 per year in advance in the United States; $12.00 in Canada and foreign countries. Current single numbers $2.00. All Special Numbers $4.00. Prices for such back numbers as are available will be quoted on request.

Address all correspondence to

The American Journal of Surgery

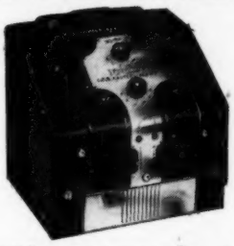
49 WEST 45TH STREET • NEW YORK 19

THE FRANKFELDT SNARE



Compact, well-insulated, and especially adapted for use with modern high frequency generators of tissue-cutting and coagulation currents—the Frankfeldt Snare is a welcome addition to the armamentarium of the surgeon in his proctologic work. Not only does it simplify operative procedures, but it renders accessible for exposure or attack those pathologic changes within the terminal area of the bowel which are ordinarily difficult to approach.

THE WAPPLER COLD CAUTERY SCALPEL



Provides accurately controlled electrosurgical currents for superficial or massive coagulation, excision of polypi, bloodless excision of biopsy specimens, and many other proctological procedures. Ideally suited for use with the Frankfeldt Snare.

Embodied in the Frankfeldt Snare are these five unique advantages:

1. Angular construction permitting ample visualization of the part to be treated.
2. Stem or snare arm available in any size (6, 10 and 14 inches are standard), arm is insulated throughout its length for safe usage through metal proctoscope tube without shorting or sparking.
3. Stainless steel hinged snare loop adjustable to any size.
4. Any number of jaw tips may be attached, for special purposes, simply by insertion of wire with screw-on arrangement, at distal end.
5. Various types of jaw tips (see illustration) are available. The patented hinged tip of the stainless steel snare wire loop minimizes possibility of breakage under strain, and assures an open loop.

FREDERICK J. WALLACE
President

ESTABLISHED IN 1900 BY REINHOLD H. WAPPLER

AMERICAN CYSTOSCOPE MAKERS, INC.

1241 LAFAYETTE AVE. NEW YORK 59, N. Y.

Various raw materials–
Curity
ZYTOR SUTURES
NON-STERILE
SINGLE FILAMENT
NON-ABS.
SIZE 1
NO. R 55—FINE
Sterilize by boiling in plain water or autoclaving.
Approximately 80 Yards
BAUER & BLACK
Curity
ZYTOR SUTURES
NON-STERILE
MULTI-FILAMENT
NON-ABSORBABLE
SIZE 00
NO. R 05
Sterilize by boiling in plain water or autoclaving.
Approximately 90 Yards
BAUER & BLACK
Curity
TENSION SUTURES
DERMAL SU
H_2O
Curity
TWISTED SILK
WHITE SIZE 0
NO. K 74
TYPE A, U.S.P.
UNTREATED
To sterilize, boil in plain water, or autoclave.
1 Spool—
Approximately 310 yards or ½ oz.
BAUER & BLACK
Curity
BRAIDED SILK
WHITE SIZE 1
NO. M 75
BAUER & BLACK
Curity
TWISTED SILK
M 33 Curity SIZE 00
T 22 Curity SIZE 000

but uniformly high quality

in

Curity
REG. U.S. PAT. OFF.

NON-ABSORBABLE SUTURES

The sources of Curity Non-Absorbable Sutures vary—from the tenuous spinnings of the silkworm to the coal, water and air that produce nylon—yet the uniform high quality of Curity Sutures is constant. The same high standards, rigid control over processing and packaging, and careful selection of raw materials applied to Curity Catgut are used in the manufacture of Curity Non-Absorbable Sutures.

ZYTOR Sutures are a Curity "first"—the original suture made from nylon. Curity Dermal and Tension Sutures are widely known and the most widely *used* for dependable performance as skin and stay sutures. Curity Silk, Silkworm Gut and Horsehair Sutures are also available to meet your requirements for non-absorbable sutures. Curity Non-Absorbable Sutures are conveniently available at your regular source of surgical supplies.

Try Curity Non-Absorbable Sutures soon. You'll be more than satisfied with their performance.

ORDER THROUGH YOUR DEALER

Curity Suture Laboratories

BAUER & BLACK

Division of The Kendall Company, Chicago 16

SUTURE RESEARCH . . . TO ESTABLISH A FINE BALANCE OF NECESSARY CHARACTERISTICS

Curity
REG. U.S. PAT. OFF.
SUTURES

BRISTOL Penicillin in Oil and Wax is now

LIQUID

. . . for easier administration

Now you can inject Bristol's Crystalline Sodium Penicillin G in Oil and Wax (Romansky Formula) with far greater ease than in the past. Due entirely to changes in the manufacturing process and without any alteration in formula, the viscosity of the product at room temperature has been brought to a point which approximates that of U.S.P. glycerin. This is a significant development in penicillin therapy. Specify Bristol and obtain the benefits of LIQUID Romansky Formula.

Supplied in one cc. cartridges of 300,000 units, with or without special syringe equipment, and in 10 cc. rubber-stoppered vials. Needs no refrigeration in storage or warming before use.

Bristol LABORATORIES INC., SYRACUSE, NEW YORK

Harnessing The Tides!

PATENT PENDING

Tidal Irrigation by

GOMCO

IS REDUCED TO AN EXACT PROCEDURE

SIMPLE! THE DOCTOR simply sets the GOMCO Tidal Irrigator at patient's symphysis pubis level—determines the bladder emptying pressure—and sets the rate of flow of irrigating fluid.

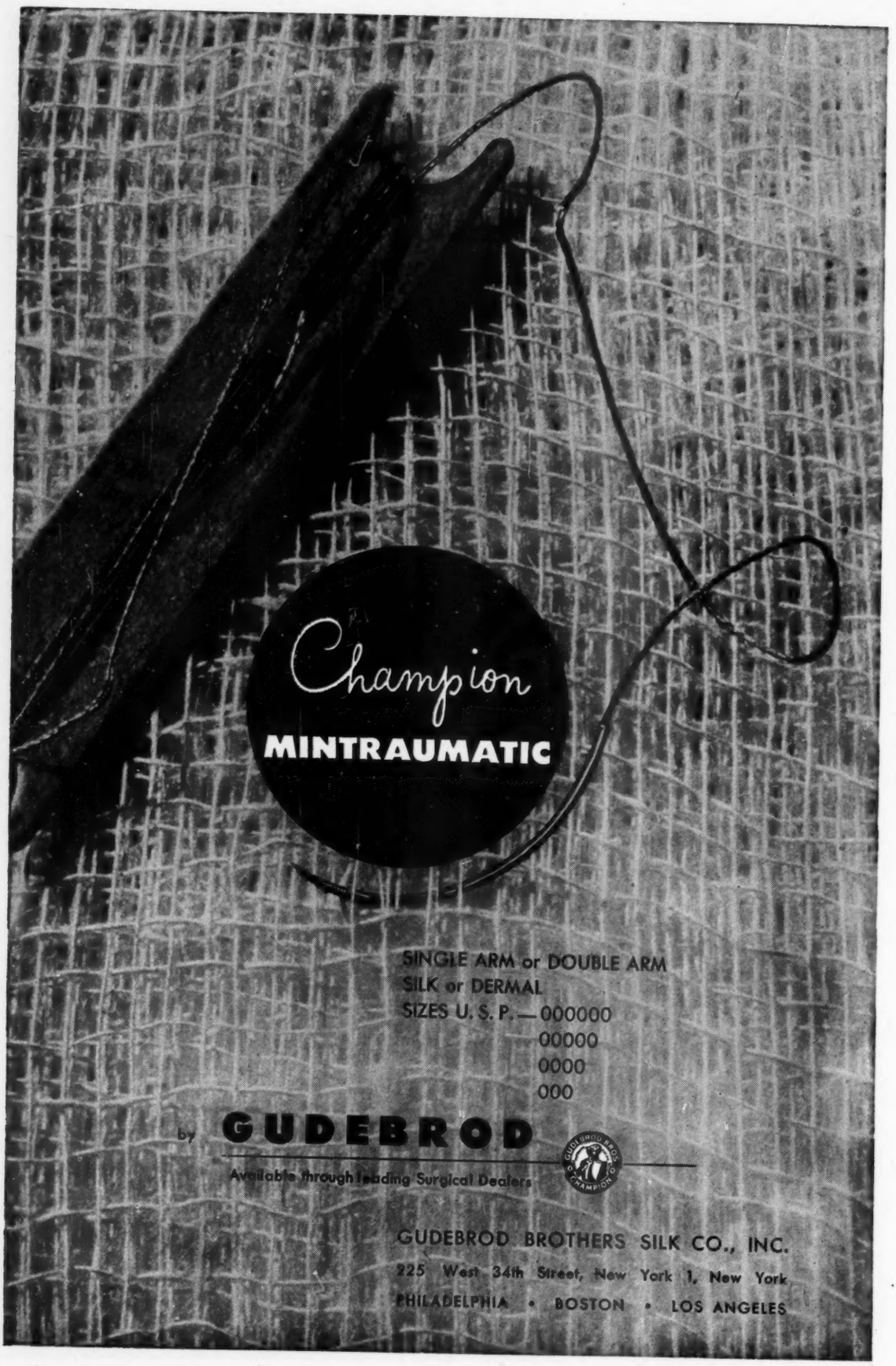
THE NURSE fills the reservoir and empties the receptacle.

DEPENDABLE! The GOMCO Tidal Irrigator does the rest! The procedure is as simple and exact as that... and as trustworthy and efficient as it is simple.

EASY TO KEEP CLEAN, TOO!
Take advantage of this easier, more exact technic. Ask your dealer about the GOMCO Tidal Irrigator, or write:

GOMCO SURGICAL MANUFACTURING CORP.
846M E. FERRY STREET BUFFALO 11, N. Y.

GOMCO EQUIPMENT
Fostering Improved Technics


Champion
MINTRAUMATIC
SINGLE ARM or DOUBLE ARM
SILK or DERMAL
SIZES U. S. P. — 000000
00000
0000
000
by GUDEBROD
Available through leading Surgical Dealers
GUDEBROD BROTHERS SILK CO., INC.
225 West 34th Street, New York 1, New York
PHILADELPHIA • BOSTON • LOS ANGELES

Quality is Imperative . . .

DEMAND SURGICAL INSTRUMENTS BEARING THIS TIME-HONORED TRADEMARK

To the experienced, there can never be a compromise with quality. The skill of the surgeon is predicated to an appreciable extent upon the dependable quality of the instruments at his command. Logically, the superiority of Kny-Scheerer instruments, long traditional among the profession, bears particular emphasis at this time. Quality instruments pay dividends in longer periods of satisfactory service and minimum replacement expense.

•

Available through leading dealers everywhere

KNY-SCHEERER CORPORATION

483 FIRST AVENUE, AT 28TH STREET • NEW YORK 16, N. Y.

VITALLIUM surgical appliances are X-RAY INSPECTED . . . . . .

All weight-bearing Vitallium surgical appliances undergo rigid X-ray inspection. Appliances so examined include bone plates and screws, hip nails, hip screws, bolts, arthrodesis and fracture nails and lag screws. Illustrated is a group of Sherman-Type Bone Plates undergoing a routine production-line inspection by X-ray.

X-ray equipment has made possible extensive research into production techniques to secure optimum physical properties in the appliances as cast. This research has resulted in substantial over-all improvement in the appliances produced.

. . . . order through YOUR surgical dealer . . . .

Vitallium surgical appliances:

BONE PLATES AND SCREWS . . .
INTERTROCHANTERIC APPLIANCES
FRACTURE NAILS . . . HIP NAILS . . .
HIP CAPS . . . SKULL PLATES . . . BLOOD
VESSEL TUBES . . . BILE DUCT TUBES
. . . JAW FRACTURE APPLIANCES

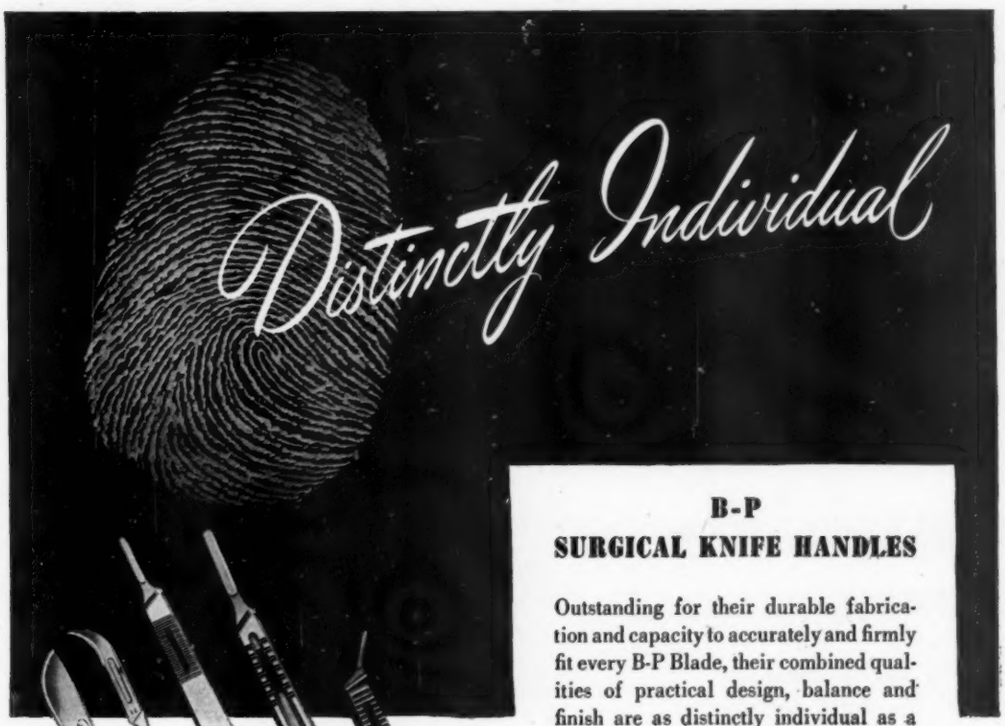
VITALLIUM STRONG · NEUTRAL · PASSIVE IN VIVO
Completely tolerated by bone and tissue

Trade Mark Reg. U. S. Pat. Off.

MICROCAST · VITALLIUM · TECHNIQUE

Austenal Laboratories, Inc.

224 East 39th Street, NEW YORK 16, N. Y. • Chicago Plant at 5932 Wentworth Avenue



B-P
SURGICAL KNIFE HANDLES

Outstanding for their durable fabrication and capacity to accurately and firmly fit every B-P Blade, their combined qualities of practical design, balance and finish are as distinctly individual as a fingerprint.

Genuine B-P Handles may be readily distinguished by the Gothic Arch pattern of the distal ends . . . a time-conserving aid in blunt dissection. As quality products, they are built for long periods of satisfactory service . . . designed to resist the damaging effects of hard, constant use. In the end, more economical by far.

AVAILABLE PATTERNS INCLUDE—

Nos. 3, 4 and 7	For general surgical use.
Nos. 3L and 4L	Elongated handles for deep surgery.
No. 3LA	An offset, elongated handle for use in hysterectomies.
No. 9	A small, finely balanced handle for ophthalmic, plastic and minor surgical use.

Ask your dealer

BARD-PARKER COMPANY, INC.

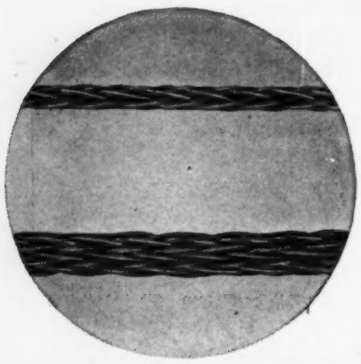
Danbury, Connecticut

B-P

A BARD-PARKER PRODUCT

BRAIDED TANTALUM

A USEFUL, NEW SUTURE MATERIAL



Many individual strands of wire are in Ethicon Braided Tantalum. Photomicrograph, above, shows Sizes 3-0 and 1, magnified to x15.

ETHICON TANTALUM FOR SURGICAL USE

Sutures. Monofilament: Sizes 6-0, 5-0, 4-0. Swaged to Eyeless Atraloc needles. *Braided:* As described at right.

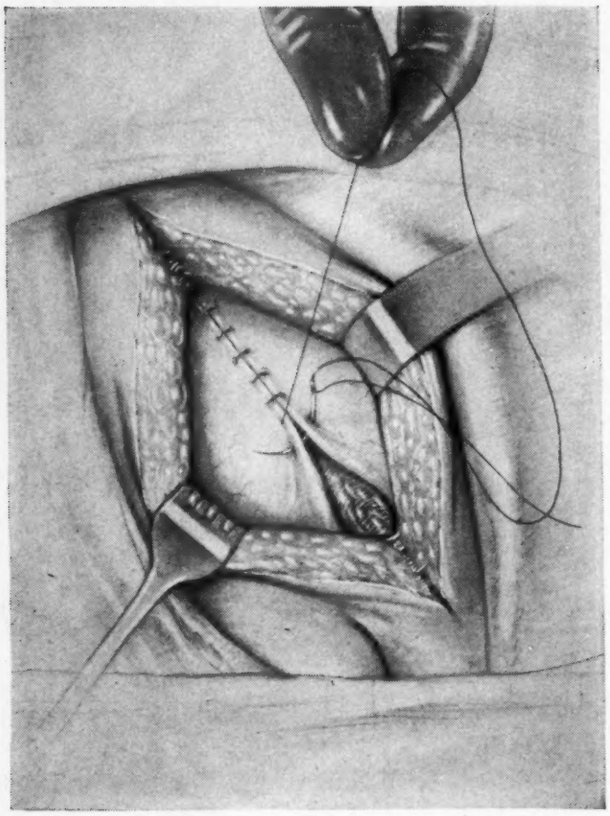
Wire. Suturing material on spools. Sizes 6-0, 5-0, 4-0, 000, 0, 2, 4.

Ribbon. For making neurosurgical hemostasis clips. Clips also supplied ready-made.

Sheet. For skull plates in cranioplasty and general plastic surgery.

Foil. Used in neuro- and orthopedic surgery for protection of nerves and tendons.

Literature describing use of Ethicon Tantalum products available on request.



● Braided tantalum is a new Ethicon suture material which offers the surgeon certain qualities not found in other sutures.

1. Its "handling properties" are superior to monofilament wire. It is much stronger than silk and less variable in size.
2. Its tensile strength is not affected in the presence of infection.
3. When Braided Tantalum is used as a buried suture, the attachment of the tissues to the suture aids greater anchorage.

Ethicon Braided Tantalum Sutures are supplied in Sizes 5-0 to 1, in 60 inch length on card reels.

Braided Tantalum has been found of special value for general surgical closure, plastic surgery, tendon repair and herniorraphy.

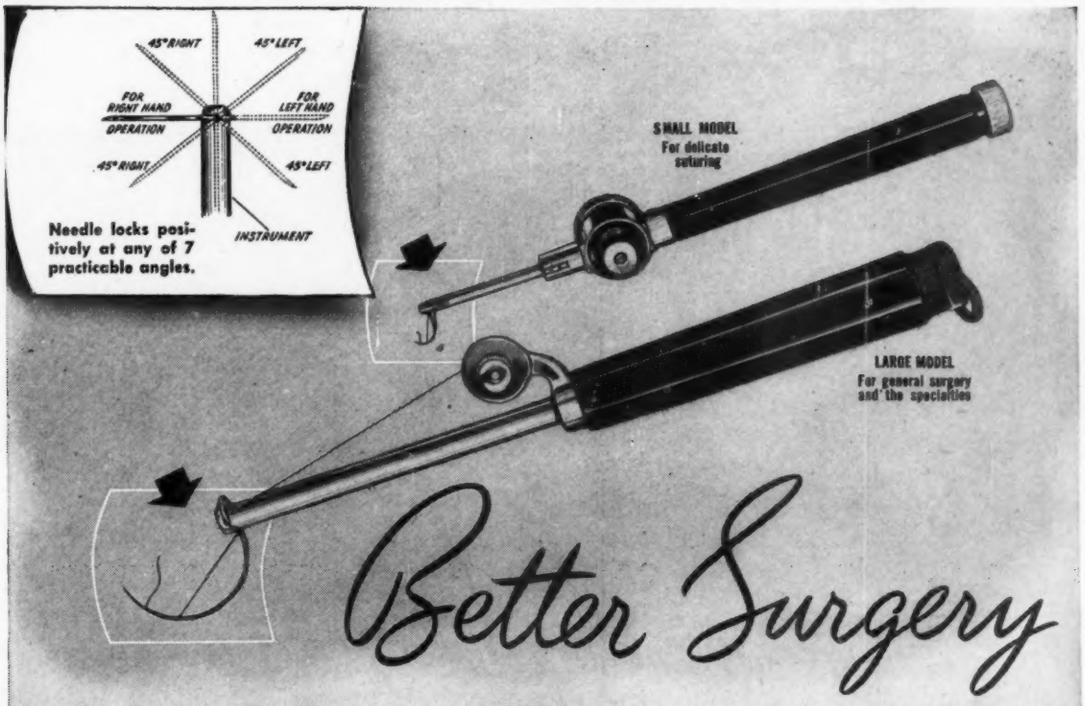
ETHICON

Sutures

FOR EVERY SURGICAL PURPOSE

ETHICON SUTURE LABORATORIES

Division of Johnson & Johnson, New Brunswick, N. J.



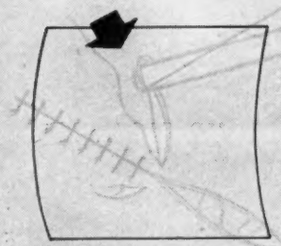
Better Surgery

WITH FREEDOM FROM NEEDLE HOLDER DIFFICULTIES

In the Singer Surgical Stitching Instruments the conventionally separate entities of needle, needle holder and suture supply have been united in one single instrument. • This ingenious construction entirely eliminates holder difficulties. Singer needles are securely locked at any of seven practicable angles . . . thus slipping of the needle from the holder because of too loose clamping, or breaking off because of too tight clamping, or shifting of position are quite impossible. Yet the needle may be quickly loosened for adjustment and relocking in a new position by a simple turn of the handle lock nut. • Send for a comprehensively illustrated booklet to obtain full details about the many other advantages of the Singer suturing instruments . . . increasingly the choice of discriminating surgeons.

SINGER
SURGICAL STITCHING INSTRUMENTS

Bobbin-wound sutures (catgut, cotton, nylon, silk) available through Davis & Geck, Inc., Brooklyn, New York.



* *Our three newest films available for showing are (1) "Rehabilitation of Parkinson's Syndrome", (2) "Treatment of Major Neuralgias", and (3) "Removal of Tumor of the Bladder".*

SINGER SEWING MACHINE COMPANY
Surgical Stitching Instrument Division • 149 Broadway, New York 6, N. Y.

Without obligation, please send copy of illustrated booklet. A-87

Name_____

Address_____

City_____ Zone____ State_____

COPYRIGHT, U.S.A. 1946, BY THE SINGER MANUFACTURING CO. ALL RIGHTS RESERVED FOR ALL COUNTRIES.

Coming • Two Fine Symposia in

INDUSTRIAL SURGERY

under the guest editorship of

LOYAL A. SHOUDY, M.D.

Medical Director, The Bethlehem Steel Co., Bethlehem, Pa.

SEPTEMBER 1947

The Present Concepts Concerning the Care of the Burned Patient
WILLIAM E. ABBOTT, M.D., *Detroit, Mich.*

Back Injuries in Industry — JOHN D. ADAMS, M.D., G. KENNETH COONSE, M.D., *Boston, Mass.*

Roentgenography—X-ray Diagnosis of the Spine — ALBERT FERGUSON, M.D., *Boston, Mass.*

Emergency Eye Care in General Practice — F. BRUCE FRALICK, M.D., *Ann Arbor, Mich.*

Trauma to the Peripheral Nerves — E. S. GURDJIAN, *Detroit, Mich.*

Caution in Handling the Extensively Injured — ROBERT H. KENNEDY, M.D., *New York, N. Y.*

Amputation Lessons from the War — HENRY H. KESSLER, M.D., *Newark, N. J.*

Antibiotics in the Surgery of Trauma — CONRAD R. LAM, M.D., *Detroit, Mich.*

Free Tendon Grafts in Secondary Flexor Tendon Repair
J. WILLIAM LITTLER, M.D., *Phoenixville, Pa.*

Common Shoulder Injuries—Diagnosis & Treatment — H. L. MCLAUGHLIN, M.D., *New York, N. Y.*

Chemical Burns of the Human Cornea — RALPH S. MCLAUGHLIN, M.D., *Charleston, W. Va.*

Experience in the Surgery of Trauma — JOHN J. MOORHEAD, M.D., *New York, N. Y.*

Abdominal Injuries — GROVER PENBERTHY, M.D., *Detroit, Mich.*

Injuries of the Genitourinary Tract — WALTON K. REXFORD, M.D., *Detroit, Mich.*

Plastic Surgery in Industry
CLAIRE L. STRAITH, M.D., MATTHEW A. PIELING, M.D., *Detroit, Mich.*

Reconstructive Surgery of the Injured Nail — WILSON A. SWANKER, M.D., *New York, N. Y.*

Fundamentals in the Care and Treatment of Fresh Wounds
J. HUBER WAGNER, M.D., *Pittsburgh, Pa.*

Internal Fixation in Fractures of the Os Calcis — ALFRED H. WHITTAKER, M.D., *Detroit, Mich.*

Operative Indications in Trauma to the Low Back
PHILIP D. WILSON, M.D., L. RAMSAY STRAUB, M.D., *New York, N. Y.*

Each $4.00—or both included in a year's

The American Journal of Surgery

NEUROSURGERY

under the guest editorship of

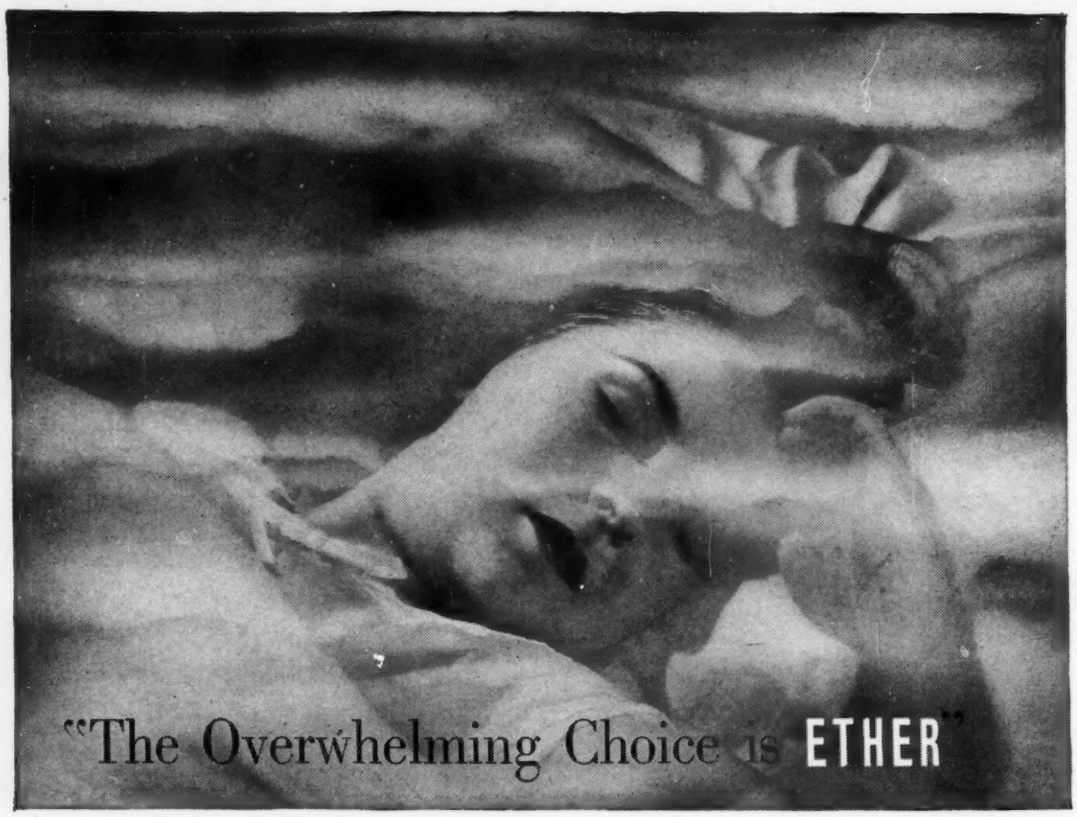
JEFFERSON BROWDER, M.D.

Professor of Clinical Surgery, Long Island College, Brooklyn, N.Y.

DECEMBER 1947

Prefrontal Leucotomy	JAMES W. WATTS, M.D., *Washington, D. C.*
Peripheral Nerves	THOMAS I. HOEN, M.D., *New York, N. Y.*
Pain in the Face	FRANCIS C. GRANT, M.D., *Philadelphia, Pa.*
Ménière's Disease	BRONSON S. RAY, M.D., *New York, N. Y.*
Pituitary Tumors	LEO M. DAVIDOFF, M.D., *New York, N. Y.*
Cerebral Aneurysms	JAMES L. POPPEN, M.D., *Boston, Mass.*
Rehabilitation of Paraplegics	DONALD MUNRO, M.D., *Boston, Mass.*
Congenital Malformations of the Brain and Spinal Cord	FRANC D. INGRAHAM, M.D., *Boston, Mass.*
Hypertension	MAX M. PEET, M.D., *Ann Arbor, Mich.*
Lumbar Discs	ROY GLEN SPURLING, M.D., *Louisville, Ky.*
Cervical Discs	R. EUSTACE SEMMES, M.D., *Memphis, Tenn.*
Brain Abscesses	EDGAR F. FINCHER, M.D., *Atlanta, Ga.*
Fractures of the Spine	W. GAYLE CRUTCHFIELD, M.D., *University, Va.*
Exophthalmus with Discussion of End Results	HOWARD C. NAFFZIGER, M.D., *San Francisco, Calif.*
Spinal Cord Tumors	WINCHELL McK. CRAIG, M.D., *Rochester, Minn.*
Athetosis and Surgical Treatment	PAUL C. BUCY, M.D., *Chicago, Ill.*
Blood Clots in the Head	E. S. GURDJIAN, M.D., *Detroit, Mich.*
Intractable Pain Associated with Malignant Disease	OLAN R. HYNDMAN, M.D., *Denver, Colo.*
Surgical Treatment of Epilepsy	A. EARL WALKER, M.D.., H. C. JOHNSON, M.D., *Chicago, Ill.*

subscription at $10.00—$12.00 foreign



Ease of administration and simplicity of the necessary apparatus make Ether the most popular and overwhelming choice of most anesthetists.* Comparative safety in even the lower stages of deepest anesthesia is possible. Any stage of anesthesia may be obtained. For years Ether has been the choice in operations of long duration.

Eight decades of Mallinckrodt research and manufacture have produced an Ether which has become the choice of many anesthetists because of its unsurpassed uniformity in potency, purity and stability.

Mallinckrodt Ether for Anesthesia is supplied in ¼-lb., ½-lb., 1-lb. and 5-lb. cans.

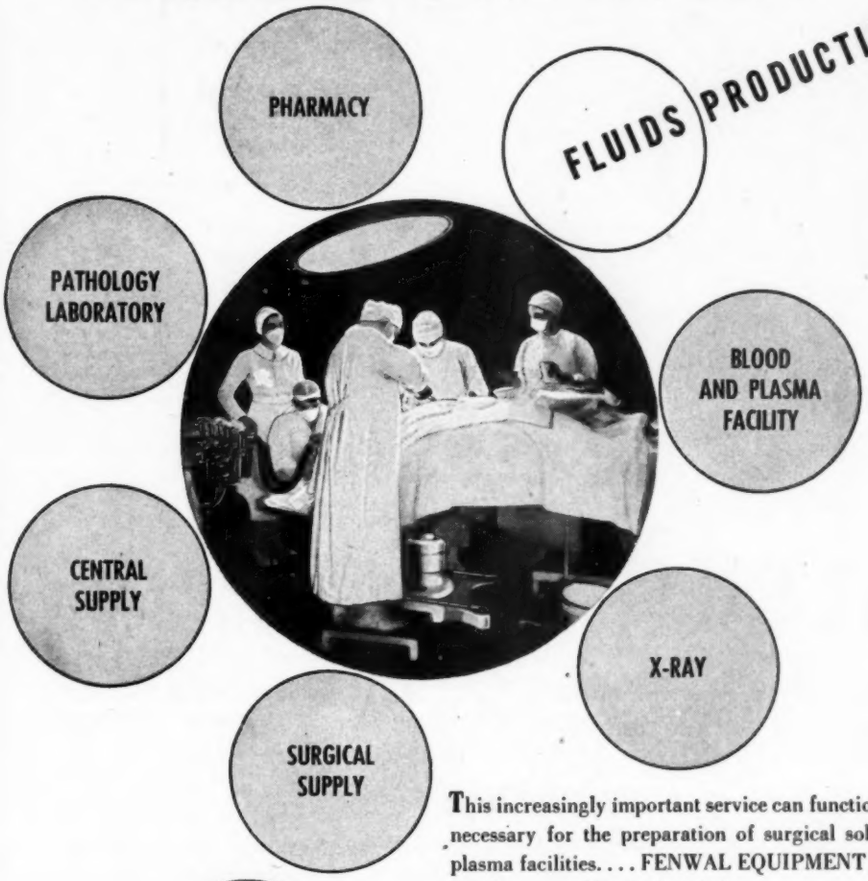
*Burgoyne, J. R.: Surgery of the mouth and jaws, Dent. Items of Interest, 68: 479-89 (May) 1946.

MALLINCKRODT CHEMICAL WORKS
80 Years of Service to Chemical Users
Mallinckrodt St., St. Louis 7, Mo. • 72 Gold St., New York 8, N.Y.
Chicago • Philadelphia • Los Angeles • Montreal
UNIFORM • DEPENDABLE • PURITY

Mallinckrodt's sound motion pictures "ADVENT OF ANESTHESIA" and "ETHER FOR ANESTHESIA" are available to medical societies and other professional groups. Write to our St. Louis or New York office for details.

Centralization means economy

Few hospital departments which form the chain of services that focus on the surgery, can offer an economy potential comparable to the



This increasingly important service can function to centralize equipment necessary for the preparation of surgical solutions, whole blood and plasma facilities. . . . FENWAL EQUIPMENT permits independent production control by the hospital.

The Fenwal technic of producing sterile fluids is appreciably less difficult than that of collecting blood and producing plasma. . . . FENWAL EQUIPMENT can be operated accurately and safely by any trained attendant.

Negligible space is required for a Fenwal installation, a major proportion of which is essential to the blood bank facility as well. Centralization can thus mean important economies in time and labor *plus* the savings in Solution costs that will many times exceed the outlay for equipment and supplies.

Fenwal

ORDER TODAY *or write immediately for further information*

MACALASTER BICKNELL COMPANY

243 Broadway **Cambridge 39, Massachusetts**

For Skin Protection . . .

In Place of Tincture of Benzoin

NEW! Now Available in Tubes

SEALSKIN LIQUID PLASTIC SKIN ADHESIVE

Pat. Applied For

SEALSKIN is a hypo-allergenic LIQUID PLASTIC SKIN ADHESIVE that dries to a strong yet soft elastic COHESIVE film which adheres to the skin and dressings. The film is waterproof and resistant to the action of body fluids, acids, etc.

Simply apply Sealskin around (not on) area of wound as a protective skin covering. Apply strapping when thoroughly dry.

Use 3 Ways

- ★ SEALSKIN to adhere dressings or bandages to the skin—wound dressings—skin traction bandages, etc.
- ★ SEALSKIN to prevent adhesive plaster skin reactions. Apply a protective coating to the skin before applying adhesive plaster. It peels off with the plaster leaving no debris.
- ★ SEALSKIN to prevent excoriation of the tissue in cases of draining fistulae, colostomies and the like.

J-500 .....Per 4-oz. tube $1.50
J-502 .....Per 16-oz. jar $3.75

Write for literature on your letterhead please.

Order from your surgical supply dealer.

CLAY-ADAMS CO INC.

44 EAST 23rd STREET, NEW YORK, N. Y.

"This problem of undernutrition extends to every medical and surgical ward and yet, I confess, is the most neglected field of promise in medicine."

DUNCAN[1]

Since it is impossible for the physician to stand guard over every patient at every meal

. . . and *since*, "Although a full, well-balanced diet best meets nutritional needs, it is frequently impossible for the injured or sick to take such a diet."[2]

. . . and *since* the patient's vitamin reserves are rapidly and relentlessly depleted by metabolic processes . . .

In many hospitals it is becoming routine to administer therapeutic dosages of *all* the essential vitamins when this procedure appears to be indicated.

For nutritive *therapy* SQUIBB offers truly therapeutic preparations – entirely separate and apart from those Squibb preparations offered for *maintenance*.

SQUIBB

MANUFACTURING CHEMISTS TO THE MEDICAL PROFESSION SINCE 1858

For further information, write to Squibb Professional Service Dept. *745 Fifth Avenue, New York 22, N. Y.*

1. Duncan, G. G.: M. Clin. North America 30:349 (March) 1946.
2. Peters, J. P., and Elman, R.: J.A.M.A. 124:1206 (April 22) 1944.

rapid control!

In POST-OPERATIVE and TRAUMATIC INFECTIONS

shortens healing time!

aids exudation!

promotes granulation tissue!

Clinical studies:

In a series of 94 patients treated post-operatively with **Glycerite of Hydrogen Peroxide ipc** for ***hemorrhoidectomies, fistulectomies, excisions of anal ulcers, abdomino-perineal resections, and pelvi-rectal abscesses*** demonstrated healing in **one half the time** required by a control series of patients treated by the usual therapeutic means . . .

Apply directly, or as a wet dressing, two—four times daily. Supplied in four-ounce bottles.

GLYCERITE OF HYDROGEN PEROXIDE *ipc*

Non-selective. Non-toxic. Non-sensitizing. Non-irritating. Prolonged bactericidal potency

Bibliography: *New Eng. J. Med. 234:468, 1946. J. Invest. Derm. 8:11, 1947. Science 105:312, 1947. Am. J. Surgery In press.*

Literature on request.

International PHARMACEUTICAL CORPORATION

132 Newbury Street, Boston 16, Massachusetts

Pardon our stiff necks —

But it pays off in safer SAFTIFLASK SOLUTIONS

You couldn't find a more skeptical bunch of technicians than Cutter's testing staff. Always going around flexing their vocal muscles, saying *"Show me!"*

They don't believe *any* product is safe for intravenous injection—*unless* the tests say so. And they rig up tests for Saftiflask Solutions that a delicate vaccine would be proud to pass. Fact is, they borrow lots of their tricks from testing Cutter biologicals.

Result is, when they grant an "okay" to Saftiflask Solutions, it's only because try as they will, they can't find any more testing hoops to put them through.

For trouble-free performance, too, see what Saftiflask *simplicity* offers: Completely assembled equipment — no gadgets to fuss with. An air tube for quick starting and steady flow. The patented Safticlamp which provides one-thumb control of flow through tubing. For a demonstration, just call your Cutter representative.

CUTTER LABORATORIES

BERKELEY 1, CALIFORNIA

penicillin troches-C.S.C.

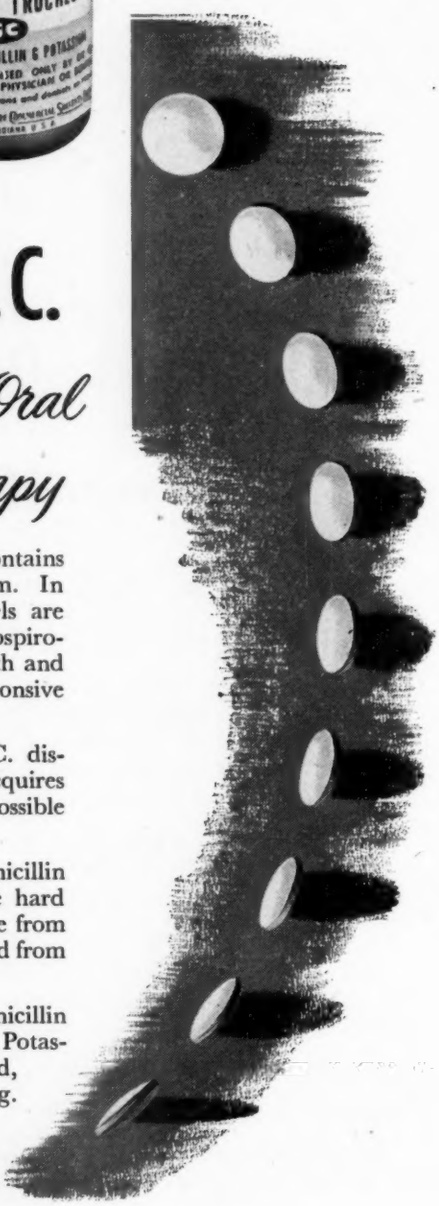
For Prolonged Intra-Oral Penicillin Therapy

HIGH POTENCY. Each Penicillin Troche-C.S.C. contains 5,000 units of Crystalline Penicillin G Potassium. In consequence relatively high penicillin saliva levels are attained for maximal therapeutic efficacy in fusospirochetal (Vincent's) infection of the gingivae, mouth and pharynx, and certain other oral infections responsive to penicillin.

SLOW DISINTEGRATION. Penicillin Troches-C.S.C. dissolve slowly within the mouth, a process which requires from one to two hours. Thus prolonged action is possible from a single troche.

ADHERES TO PALATE. Lenticular in shape, Penicillin Troches-C.S.C. readily fit into the curve of the hard palate, adhering to the mucosa on gentle pressure from the tongue. A penicillin depot is thereby established from which the antibiotic diffuses into the saliva.

CRYSTALLINE POTASSIUM PENICILLIN G. Penicillin Troches-C.S.C. contain Crystalline Penicillin G Potassium Salt. This form of penicillin is highly purified, having a potency of not less than 1435 units per mg.



C.S.C. Pharmaceuticals
A DIVISION OF
COMMERCIAL SOLVENTS CORPORATION
17 E. 42nd Street CSC New York 17, N.Y.

A copy of this illustrated procedure as well as others in the Armour surgical illustration series will be sent to physicians and surgeons when requested on a professional letterhead.

CHOLECYSTECTOMY, from below up

Some surgeons prefer to remove the gall bladder by starting at the tip or fundus and working toward the neck (from above down). Others follow the retrograde method (from below up). Still others prefer to make no set rule, but choose the technique for each case depending on the conditions found. The technique for cholecystectomy from above down has been illustrated in a previous plate of this series. On the following pages, the reverse technique is illustrated as practiced by a leading surgeon. It is recognized also that aside from the two major subdivisions in technique mentioned above, there are numerous individual variations.

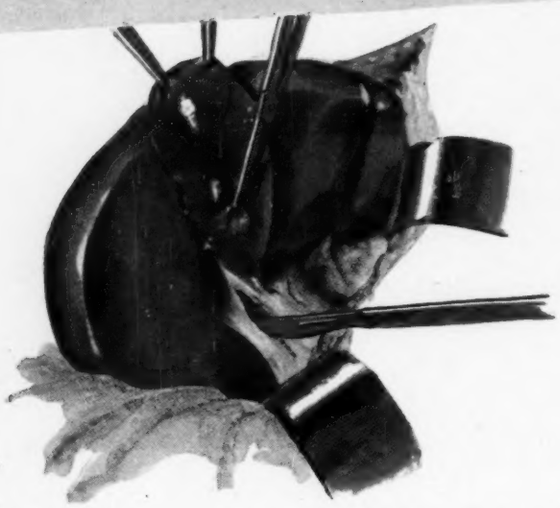
Regardless of the specific technique employed, the quality of the suture material employed is of major importance in this as in other operations. The excellent handling and tying properties of ARMOUR SURGICAL GUT increase the facility of the operation, and its fine tensile strength, unformity, and absolute sterility make for greater safety and security. Good surgery demands the best in suture and ligature material – specify ARMOUR SURGICAL GUT.

ARMOUR SUTURES and LIGATURES

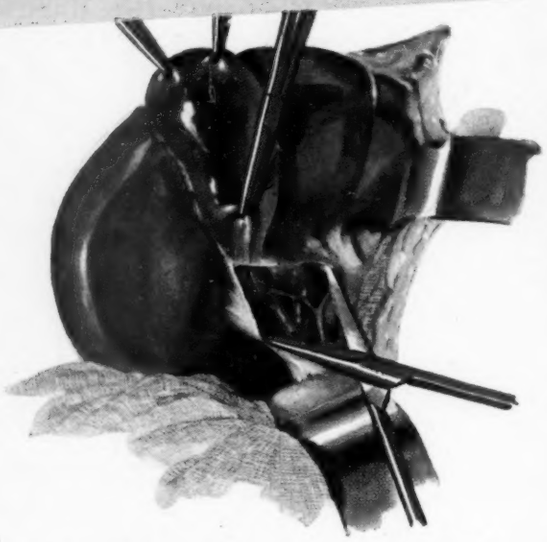
THE ARMOUR LABORATORIES • CHICAGO 9, ILLINOIS

CHOLECYSTECTOMY, from below up

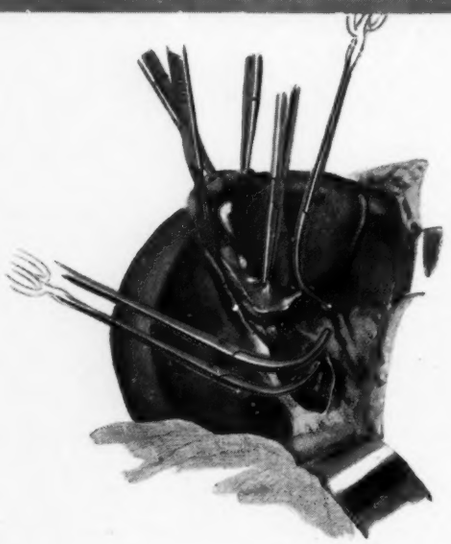
"There are variations in surgical procedures as practiced by different surgeons. These illustrations show a technique exercised by certain outstanding operators. They are presented by The Armour Laboratories in the belief that they may prove of interest to the profession as a whole."



I. Oblique trans-rectus incision. Field walled off with pads. Retractors placed. Traction made on gall bladder. Incision being made in right free border of gastro-hepatic omentum.

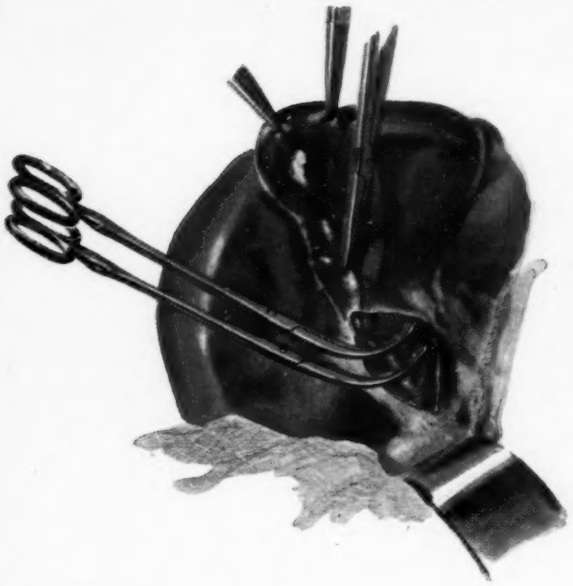


II. Incision in gastro-hepatic omentum spread by scissors – exposing the ducts and blood vessels.

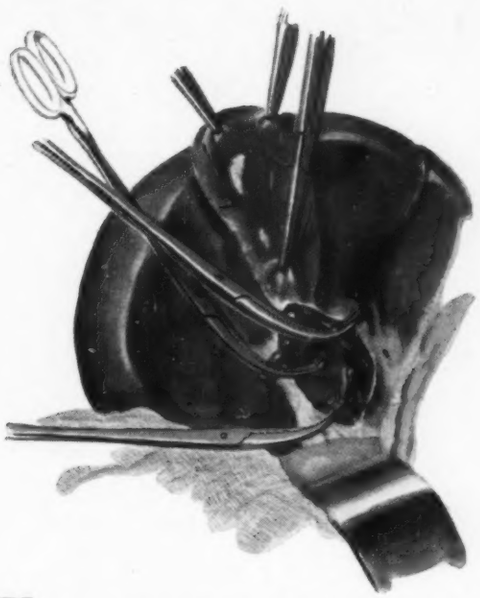


V. The peritoneal attachment is being incised around the gall bladder.

VI. Gall bladder is being separated from its bed by gauze-covered finger tip or by sharp dissection if necessary.



III. Cystic duct doubly clamped. Specially constructed "Behrend" clamps are being used in this case.



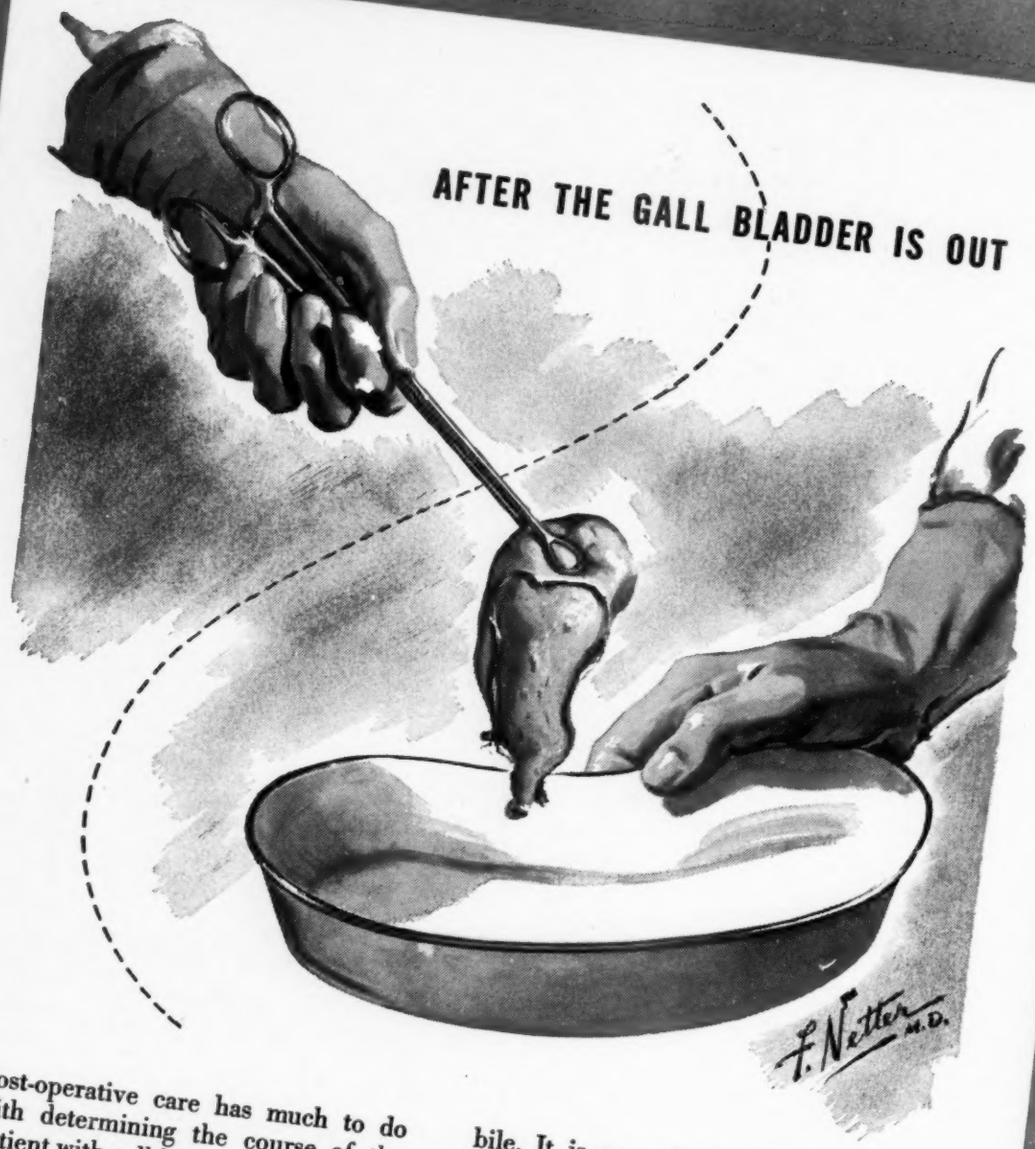
IV. Cystic duct divided. Neck of gall bladder has been pushed away with gauze-covered finger tip to better liberate cystic artery. The vessel has been clamped and is ready to be severed. Although some men prefer to ligate before dividing, this operator finds it facilitates the operation to reserve ligation of the cystic artery and duct until the gall bladder has been removed.

VII. Gall bladder now almost completely freed and turned up. Cystic artery and duct ligated. Some men prefer to transfix the duct.

VIII. Suture of gall bladder bed begun before complete removal of that structure. Oozing is then determined by placing gauze sponge in abdomen for a few minutes. This serves as indicator of whether or not to drain.

Armour Sutures and Ligatures

AFTER THE GALL BLADDER IS OUT



Post-operative care has much to do with determining the course of the patient with gall bladder disease. Judicious medical management may help insure a smooth and uneventful recovery. DEHYDROCHOLIC ACID *ARMOUR* promotes a copious outflow of thin, watery bile and thus "flushes out" the biliary system. It helps reestablish a good bile flow and acts as a general hepatic stimulant. Dehydrocholic acid is prepared by oxidizing pure cholic acid derived from fresh ox bile. It is one of the most effective choleretics known.

Supplied in 3¾ grain tablets—bottles of 50, 100, and 500.

Dose one to three tablets at mealtime.

ARMOUR *Dehydrocholic Acid*

Have confidence in the preparation you prescribe—specify "ARMOUR"

THE *Armour* LABORATORIES

HEADQUARTERS FOR MEDICINALS OF ANIMAL ORIGIN • CHICAGO 9, ILLINOIS

44

Uses for Nembutal

As the published reports pile up—now in the hundreds—short-acting Nembutal is being applied in an increasing variety of conditions. The list at right is only partial. • Because doses adjusted to the need can achieve any desired degree of cerebral depression, from mild sedation to deep hypnosis, short-acting Nembutal naturally lends itself to extensive application. • Small dosage—only about *one-half* that required by many other barbiturates—adds the advantages of shorter effect, reduced possibility of after-effect, marked clinical safety and definite economy to the patient. • In most cases, doses as small as these will suffice: *for mild sedation*, ¼ to ¾ gr.; *for simple insomnia*, ½ to 1 gr.; *for true hypnosis*, 1½ grs.; *for pre-operative medication*, 1½ grs. the night before and 1½ to 3 grs. two hours preceding the operation. • Your pharmacy can supply you with any of 11 Nembutal products in convenient small dosage forms to fit any short-acting sedative and hypnotic need.

In equal oral doses, no other barbiturate combines QUICKER, BRIEFER, MORE PROFOUND EFFECT than . . .

Nembutal®

(Pentobarbital Sodium, Abbott)

ABBOTT LABORATORIES, North Chicago, Illinois.

Sedative

Cardiovascular
Hypertension[1] Decompensation
Coronary Disease[1]
Angina[1]
Peripheral Vascular Disease

Endocrine Disturbances
Hyperthyroid
Menopause—female, male

Nausea and Vomiting
Functional or Organic Disease (acute gastro-intestinal and emotional)
X-Ray Sickness Pregnancy
Motion Sickness

Gastro-Intestinal Disorders
Cardiospasm[2] Pylorospasm[2]
Spasm of Biliary Tract[2] Colitis[2]
Spasm of Colon[2] Peptic Ulcer[2]
Biliary Dyskinesia

Allergic Disorders
Irritability
To Combat Stimulation of Ephedrine alone, etc. [3, 1]

Irritability Associated With Infections[4]

Restlessness and Irritability With Pain[5, 4]

Central Nervous System
Paralysis Agitans Chorea
Hysteria Delirium Tremens
Mania

Anticonvulsant
Status Epilepticus Tetanus
Traumatic Eclampsia
Strychnine Anesthesia

Hypnotic

Induction of Sleep

Obstetrical

Nausea and Vomiting
Eclampsia
Amnesia and Analgesia[6]

Surgical

Pre-operative Sedation
Basal Anesthesia
Post-operative Sedation

Pediatric

Sedation for:
Special Examinations
Blood Transfusions
Administration of Parenteral Fluids
Reactions to Immunization Procedures
Minor Surgery
Pre-operative Sedation

Nembutal alone or [1]Glucophylline® and Nembutal, [2]Nembutal and Belladonna, [3]Ephedrine and Nembutal, [4]Nembudeine® [5]Nembutal and Aspirin, [6]administered with scopolamine or other drugs.

Try this Yourself,

Doctor...

Rare is the person who does not enjoy a piece or two of candy at the end of a meal. The satisfying goodness of candy creates an aura of well-being which, post-prandially, is conducive to good digestion of the meal just eaten.

That candy has a worth-while place in the dietary is evident from the foods with which most candies are made—eggs, butter, milk, fruits and nuts. To the extent these foods are present, candies contribute valuable protein, B complex vitamins, and minerals.

In the sickroom, candies serve a double purpose. They frequently are eaten when many foods are refused because of anorexia, and serve to provide high caloric value in concentrated form. Of equal significance, convalescent patients usually experience a distinctly beneficial psychic lift from a tasty piece or two of candy.

These unique advantages of candies more than justify their inclusion in the daily dietary, not only of adults, but of children as well.

COUNCIL ON CANDY OF THE NATIONAL CONFECTIONERS' ASSOCIATION

1 NORTH LA SALLE STREET • CHICAGO 2, ILLINOIS

BAXTER
Protein Hydrolysate
STERILE NON-PYROGENIC
5% Protein Hydrolysate w/v in Water
Warning: DO NOT USE IF SOLUTION IS CLOUDY. DISPOSE CONTENTS IN SINGLE DOSE. DISCARD UNUSED PORTION.
Notice: Destroy this container after use.—Do not reuse.
TO BE ADMINISTERED BY VENOCLYSIS OR HYPODERMOCLYSIS USING STERILE EQUIPMENT.

BAXTER

Pioneer Name in Parenteral Therapy

● A Protein Hydrolysate Solution that is conspicuously reaction-free is another achievement of Baxter research. The perfecting of Protein Hydrolysate Baxter marks an important addition to Baxter's integrated parenteral therapy program . . . with its complete range of solutions . . . sets for separate or simultaneous infusions . . . its wide selection of simplified equipment for standardized procedures. No other method is used by so many hospitals.

★

Manufactured by
BAXTER LABORATORIES
Morton Grove, Illinois · Acton, Ontario

★

Distributed and available only in the 37 states east of the Rockies through...

AMERICAN HOSPITAL SUPPLY CORPORATION
NEW YORK • EVANSTON, ILLINOIS • ATLANTA • WASHINGTON, D. C.

THIS NEW *DIRECT METHOD* OF INJECTION
IS SIMPLE, QUICK, AND PROFESSIONALLY CORRECT!

B-D CARTRIDGE SYRINGES

PERMANENT METAL

DISPOSABLE PLASTIC

Improved and refined since their introduction with penicillin in oil and wax two years ago . . . B-D cartridge syringes have provided the simplest . . . fastest . . . most convenient method of direct injection yet devised.

P.O.B. in B-D cartridge is available from the following pharmaceutical houses:

Abbott Laboratories
Ayerst, McKenna & Harrison
Bristol Laboratories
Connaught Laboratories
Eli Lilly & Company
Parke-Davis & Company
Schenley Laboratories
Sharp & Dohme
E. R. Squibb & Sons
Upjohn Company

•

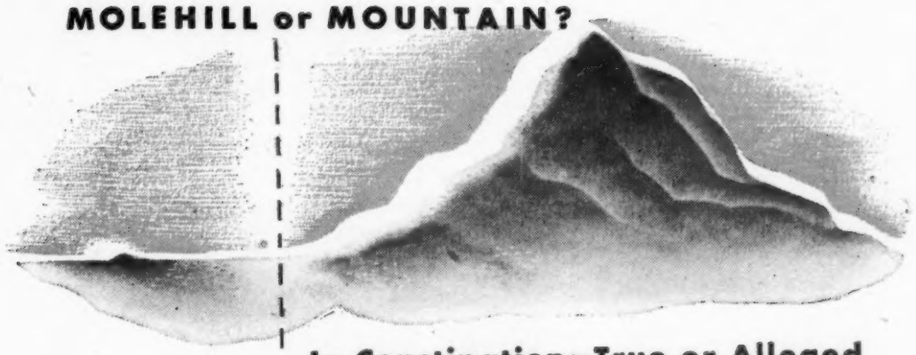
Other injection materials will follow in due course. Needles for B-D PERMANENT type syringe may be purchased through regular dealer channels.

B-D PRODUCTS
Made for the Profession

BECTON, DICKINSON & CO., RUTHERFORD, N. J.

1897— SERVING THE MEDICAL PROFESSION FOR FIFTY YEARS — 1947

MOLEHILL or MOUNTAIN?



In Constipation—True or Alleged It's MUCILOSE

When the patient who declares himself constipated has made a mountainous problem of over-purgation from a molehill of underlying cause, Mucilose—bland, lubricating bulk—is a valuable adjunct in correcting both the self-imposed laxative habit and the primary intestinal dysfunction.

Ample intestinal bulk is assured by placing the patient on Mucilose—pure, concentrated hemicellulose from psyllium. More efficient... Mucilose absorbs *50 times* its weight of water to form a bland colloidal gel—lubricates the intestinal contents and gently stimulates peristalsis.

For physiologic re-education . . . for more nearly normal evacuation and a regular "habit-time"—*it's Mucilose.*

GREATER BULK from SMALLER DOSE at LOWER COST

Mucilose

IN SPASTIC AND ATONIC CONSTIPATION

Highly purified hemicellulose concentrate, derived from *Plantago loeflingii* . . . available as flakes or granules in 4 oz. bottles and 16 oz. containers.

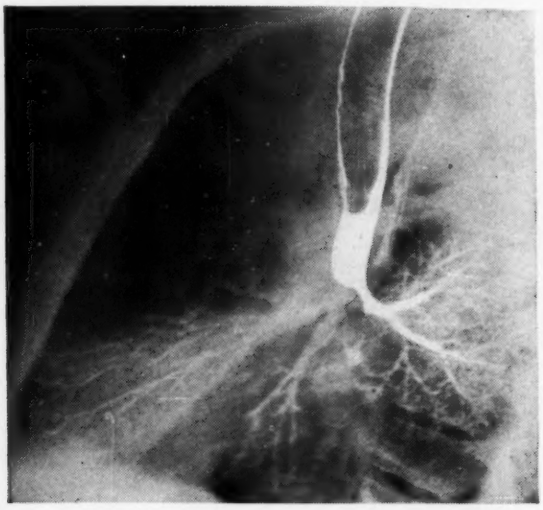
A trial supply of Mucilose will be sent to you upon request.

Fredrick Stearns & Company
Division
DETROIT 31, MICHIGAN
NEW YORK • KANSAS CITY • SAN FRANCISCO • ATLANTA • WINDSOR, ONTARIO
SYDNEY, AUSTRALIA • AUCKLAND, NEW ZEALAND

Trade-Mark Mucilose Reg. U. S. Pat. Off.

THE ADVANTAGES OF LIPIODOL DIAGNOSIS

In Diseases of the Lungs



IN many instances, Lipiodol renders a signal service by making possible topographic determination of the level and extent of bronchial occlusion due to neoplasm or a foreign body, and of fistulas and abscess cavities within the lung parenchyma. It permits of early and accurate diagnosis of bronchiectasis.

Equally valuable is the effective aid contributed by Lipiodol in the detection of cystic disease of the lung,[1] in the localization of bronchiogenic cysts,[2] and in the differentiation between infected cysts and secondary bronchiectatic changes.[3]

Being virtually nonirritant, hence rarely conducive to undesirable coughing, Lipiodol has gained a preferred position whenever bronchography is required.

Lipiodol presents iodine (40%) in firm chemical union with poppyseed oil.

---

1. Madsen, H. V., and Pirkle, H. B.: Cystic Disease of the Lung with Iodized Oil Studies, Dis. of Chest 10:433 (Sept.-Oct.) 1944.
2. Brown, R. K., and Robins, L. L.: The Diagnosis and Treatment of Bronchiogenic Cysts of the Mediastinum and Lung, J. Thoracic Surg. 13:84 (April) 1944.
3. Rusby, N. L.: Dermoid Cysts and Teratomata of the Mediastinum; a Review, J. Thoracic Surg. 13:169 (June) 1944.

E. FOUGERA & CO., INC.

75 Varick Street *Distributors* **New York 13, N. Y.**

Canadian Distributors: **VINANT LIMITED, 200 Vallée St., Montreal, Canada**

Lipiodol (LAFAY)

Lipiodol, made in the U.S.A., is available in a variety of ampule sizes and in 20 cc. vaccine-type vials.

ULTRACAIN OINTMENT

- ✓ *Prompt relief of pain, itching and burning with minimum dosage!(less than 1%) of combined para-amino benzoates . . .*
- ✓ **YET VIRTUALLY FREE FROM SENSITIZATION***
- ✓ Unusually rapid healing* of many cutaneous lesions through local anesthetic and cod-liver oil content.
- ✓ Helpful in preventing secondary infections through bacteriostatic and fungistatic action of sodium propionate (2%).
- ✓ Effective skin penetration with lipophilic base.

*Combes, F. C., Reschke, M. and Saperstein, R. B.: Topical Anesthesia Effect: on Tissue Regeneration, Am. J. Surg., July, 1947.

Indicated in:

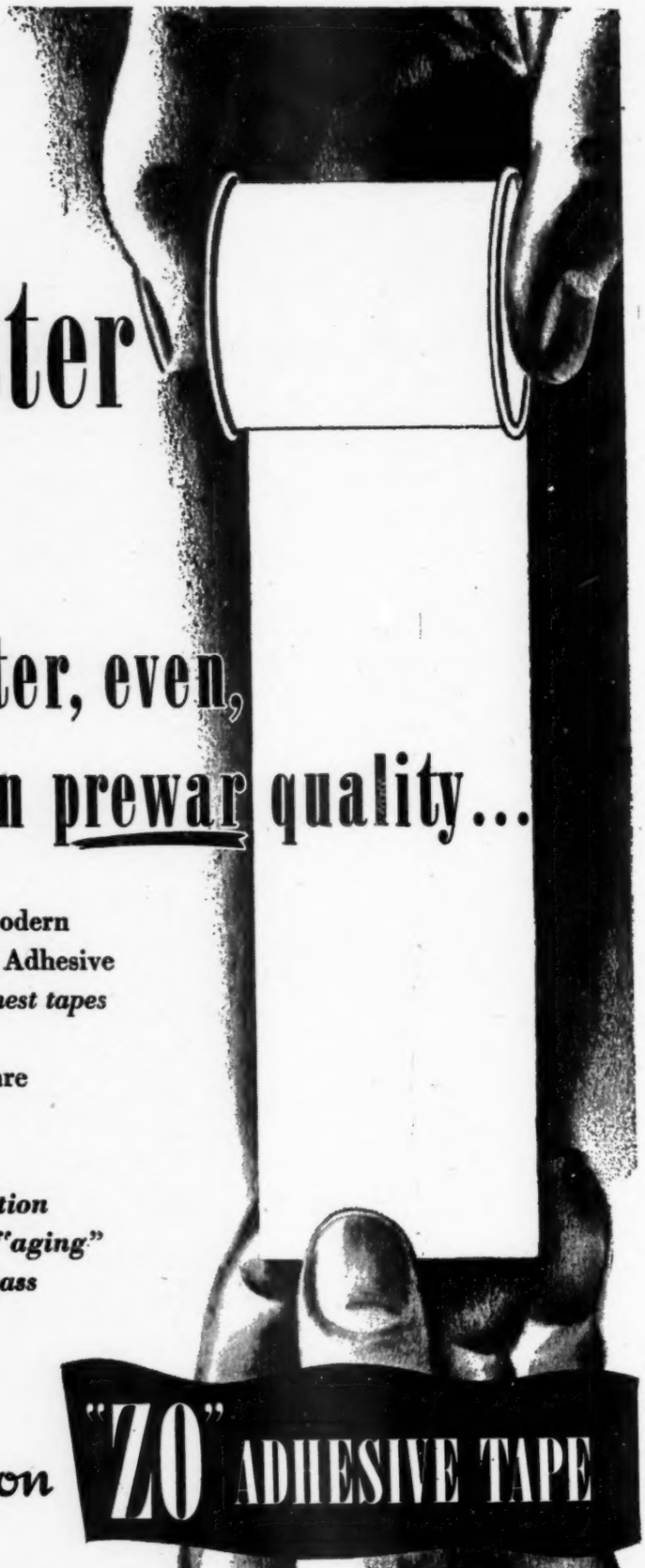
Pruritus—
ani, vulvae
Fissures
Cutaneous ulcers
Burns
Non-specific dermatitis
Hemorrhoids

Ultracain Ointment is the Registered Trade of Chatham Pharmaceuticals, Inc.

Available in 1 oz. tubes with applicator and 1 lb. jars. Samples on request.

CHATHAM PHARMACEUTICALS, INC.
Makers of Koagamin
NEWARK 2, NEW JERSEY
Distributed in Canada by
FISHER & BURPE, LTD., WINNIPEG, MANITOBA

Chatham



Now better

better, even, than prewar quality...

A product of modern research, "ZO"* Adhesive Tapes are *the finest tapes ever produced.*

For every requirement, they are unexcelled for—

1. ***Instantaneous "stick"***
2. ***Freedom from skin reaction***
3. ***Long life—resistance to "aging"***
4. ***Whiteness of adhesive mass***
5. ***Ease of unwinding***
6. ***Uniformity of quality***

ORDER FROM YOUR DEALER

Johnson & Johnson

"ZO" ADHESIVE TAPE

*TRADEMARK OF JOHNSON & JOHNSON

"FOR OVER FIFTY YEARS, THE STANDARD OF EXCELLENCE IN THE SURGICAL AND MEDICAL WORLD"

The American Journal of Surgery

Copyright, 1947 by The Yorke Publishing Co., Inc.

A PRACTICAL JOURNAL BUILT ON MERIT

Fifty-sixth Year of Continuous Publication

VOL. LXXIV AUGUST, 1947 NUMBER TWO

Editorial

OPERATIONS ON THE VAGUS NERVES IN THE TREATMENT OF PEPTIC ULCER

THE majority of surgical operations accomplish their purpose in an obvious manner, in that they remove grossly diseased organs and parts or repair injuries and defects. Examples are the amputation of a gangrenous leg and the repair of a hernia. A much smaller number of procedures are carried out because of more subtle effects which are produced as a result of anatomically small but physiologically potent structural alterations in endocrine gland and nervous tissue. The removal of a small parathyroid adenoma may stop a demineralizing process which is weakening many areas of the skeleton. The removal of a thyroid gland, an islet cell adenoma of the pancreas or an adrenal tumor is likely to change the whole complexion of things for the patient. The cutting of the white fibers in the frontal lobes has resulted in favorable personality changes; the pain of malignant disease in a remote area of the body has been relieved by a small properly placed incision in the medulla. There are circumstances which make it advisable to paralyze certain muscles by depriving them of nerve supply. A diseased lung is put at rest by crushing the phrenic nerve to its half of the diaphragm. The obturator nerve is cut to prevent troublesome adductor contractions in the spastic child. Sympathetic nerves and ganglia are removed to paralyze the smooth muscle in arterioles and diminish peripheral resistance, thus lowering blood pressure.

Until recently, there has been no good example of the surgical interruption of the nerve control of a secretory organ in order to achieve a therapeutic result. Section of the vagus nerves to the stomach in patients with peptic ulcer represents the prime example of that type of surgical approach. It is easy to think of the lesion as being due to disturbed physiology. There is an answer provided to the question "Why doesn't the stomach digest itself"? The answer: "It does a little, sometimes—and you have an ulcer." The hyperacidity of gastric juice in ulcer patients has been known for a long time. Dragstedt and his co-workers have shown that the night and resting secretions of gastric juice in such patients is increased over that of non-ulcer patients. They have stated that this excessive secretion appears to be due chiefly to an abnormally great secretory tonus in the vagus nerves and is reduced to normal values by complete vagus section.

It would appear advisable to evaluate the new physiological surgical treatment of ulcers as thoroughly and as rapidly as

possible. Several groups are doing just this. Of Dragstedt's patients which number more than one hundred seventy many have been followed for three or four years. As a result of this experience he is still enthusiastic about the procedure. Francis Moore and his co-workers have made careful observations on forty patients treated by vagus resection over a two year period. Their results have been distinctly encouraging. Grimson and his group have reported on twenty-five patients; they have emphasized some of the undesirable symptoms occurring in the immediate postoperative period, the most important of which relates to the early hypomotility.

An early solution to the problem of the ultimate value of section of the vagus nerves to the stomach has not been promoted by the giving of undue attention to minor differences in technic and terminology. In the first place it should be crystal clear that a subtotal resection of the stomach, to which a subdiaphragmatic section of the vagi has been added, should be included in category apart from that of pure vagus section. At most, a series of such patients would be of value only to indicate the prophylactic value of vagotomy in the prevention of jejunal or marginal ulcer. On the other hand, the nerve operation was never calculated to open up a stenosed pylorus. Resection or by-passing surgical procedures are plainly indicated.

Originally, Dragstedt used the transthoracic approach to the vagi; recently, he has favored the transabdominal route. It appears that a clean section can usually be accomplished either way. It is probable that as long as vagi are cut, the thoracic surgeons will attack them through the thorax and the "general and abdominal" surgeons will reach them by a transperitoneal operation. At the present time there is no proof that it makes any difference what is done with the ends of the nerves after they are cut. They may be stripped upward and downward and resected, the proximal ends can be transplanted out of the mediastinum or non-absorbable caps can be placed over them. The important thing seems to be to cut them—all of them.

It has been suggested that these nerves which have been sectioned for ulcers should not be called vagus nerves but rather, "gastric nerves." It remains to be seen if devotees of Gray's *Anatomy*, most writers on the subject of vagus resection and countless other surgeons who have always called these structures vagus nerves, can be won over to a different terminology.

Finally, it is occasionally stated that vagotomy for ulcers is not new, with some note of implication that the operation has been tried and found wanting. In answer to this, one could safely reply that the operation has been carried out with much greater frequency and thoroughness since Dragstedt's paper on the subject in 1943.

Conrad R. Lam, M.D.

Original Articles

FAT NECROSIS OF THE FEMALE BREAST*

REPORT OF ONE HUNDRED TEN CASES

FRANK E. ADAIR, M.D. AND JEAN THOMPSON MUNZER, M.D.
NEW YORK, NEW YORK

THIS is the first communication on fat necrosis of the female breast to come from the Breast Clinic of the Memorial Hospital since 1924. In May, 1920, Lee and Adair,[1] presented the original report on this condition before the American Surgical Association, describing the clinical, operative and pathological findings in two cases, and establishing fat necrosis of the breast as a definite clinical entity. Two further reports, in 1921[2] and 1924,[3] were based on an additional seven cases which had been seen at the Memorial Hospital, and included the findings in eleven other cases which had been contributed in personal communications to the authors or which had appeared in the literature. As our experience broadened from our first two cases to the twenty discussed in our third paper, we found it necessary to modify several of our original conclusions. We still, however, retained the name "Traumatic Fat Necrosis," and continued to emphasize the striking clinical similarity to cancer, with the consequent difficulties in differential diagnosis, both clinically and on gross examination of tissue excised in the operating room.

Between 1924 and 1930 a number of isolated cases were reported in the literature, and in April, 1930, Hadfield[4] presented a summary of all the cases which had been published up to that time, including three of his own, a review of the twenty cases which we had previously reported and twenty-two other cases collected from the literature. On the basis of these forty-five cases, Hadfield drew certain conclusions, namely, that the importance of the traumatic factor had been overstated by Lee and Adair in the three papers from the Memorial Hospital, and that not enough stress had been laid on the fact that in quite a fair percentage of cases, the clinical resemblance to cancer is superficial and is unlikely to lead to excision.

The only other large group of cases to be reported appeared in a paper by Menville[5] in 1935. This paper is based on a review of three thousand breast tumors collected in the Johns Hopkins surgical laboratory, of which Menville classifies fifty-eight as fatty tissue tumors. Twenty-four of these were lipomas; twenty-five were instances of fat necrosis, and the remaining nine, which Menville describes as secondary xanthomatous degeneration, probably, as he himself suggests, represent a secondary change in a pre-existing fat necrosis. Menville was interested chiefly in the pathology and pathogenesis of these conditions, and in the interrelationship existing between the lipomas and the cases of fat necrosis.

Dunphy[6] contributed an excellent paper in January, 1939, in which he again called attention to the fact that fat necrosis in the breast might present the clinical aspects of a malignant neoplasm and thus lead to ill advised surgical treatment. In the

* From the Breast Service, Memorial Hospital, New York City.

sixteen cases he presented of fat necrosis in various parts of the body, two were of fat necrosis in the breast, and two showed nodules in radical mastectomy scars. In all four of these cases the diagnosis of carcinoma was made, and the first two patients were subjected to radical mastectomy. Dunphy went on to discuss fat necrosis in other sites as well as in the breast, and included a review of the pathology of the condition.

This paper is offered in the hope that it will help to clarify the confusing clinical picture which fat necrosis may present when it appears in the female breast. In the large number of patients which we have had the opportunity to study, we have seen fat necrosis in different forms and different stages simulating many conditions; we hope that what we have learned may be of use to the clinician who comes upon the condition less frequently.

Between January 1, 1924, and January 1, 1946, the diagnosis of fat necrosis has been made on 136 patients admitted to the Breast Service of the Memorial Hospital. In one hundred ten of these cases, the final diagnosis rested on the examination of the involved tissue in the pathological laboratory, and it is on the findings in these one hundred ten cases of proven fat necrosis that this paper is based.

Incidence. These one hundred ten cases make up 0.59 per cent of the total (18,680) cases admitted to the Breast Service between January 1, 1924, and January 1, 1946, and constitute 2.75 per cent of all benign tumors during this period, with an incidence in comparison with primary operable carcinoma of the breast of 2.23 per cent. If the twenty-six cases in which we have no pathological confirmation of the diagnosis, but in which the history, physical findings and clinical course all support the diagnosis, be included, these percentages rise to 0.73 per cent of the total, 3.40 per cent of the benign tumors, and an incidence of 2.76 per cent in comparison with primary operable carcinoma. Those twenty-six patients in whom a provisional diagnosis of fat necrosis was made on the first clinic visit but who did not return for follow-up are not considered in this paper.

Age. The youngest patient in our series was fourteen, the oldest eighty. The peak was met in the fifth decade, with the next greatest frequency equally divided between the fourth and sixth decades. This corroborates our former observation and that of others that fat necrosis is primarily a disease of middle life, occurring most often in the so-called cancer decades. It does, however, show an age range not seen in our earlier cases.

Weight. Our weight range was from 101 to 255 pounds, with an average weight of 157 pounds. This agrees with former findings of obesity but to a lesser extent. Although forty-five of the 110 patients were obese, weighing 150 pounds or more, with twelve weighing over 200 pounds, in thirty-eight of the women the weight was below 150 pounds with the breasts described as "moderate size" or "small." Twenty-six patients were definitely slender. In twenty-two cases we have no information either as to body weight or as to the conformation of the breasts, and in the remaining five the breasts were "large and pendulous" although the body weight was not above average.

Etiology. A detailed mammary history was taken from each of the 110 women in this series. In sixty-two of them there was no history of trauma, no previous operative procedure, no infection and no difficulty with lactation, just the accidental discovery of a mass in the breast from two days to eight years before the first appearance at the clinic. In two additional cases, there was no known factor predisposing the breast, but these two women presented the clinical picture of relapsing febrile nodular non-suppurative panniculitis. Four women gave a history of infection; two had had superficial abscesses of the skin of the breast within a few months of the development of the mass; the other two had had incision and drainage of deep-

seated abscesses, one postpartum many years before. One patient had had *x*-ray therapy for chronic cystic mastitis which had been heavy enough to produce chronic progressive skin changes. Of the remaining forty-one cases—the only ones to whom the term traumatic could be held to apply —twelve had had a previous operation on the breast for some other condition, falling thereby into an etiological subgroup under "surgical trauma." Three had had hypodermoclysis beneath the breasts. In twenty-six cases there had been a single episode of fairly violent physical trauma, sufficiently severe in twenty-one cases to produce ecchymosis, to the site at which a lump developed within a highly variable length of time, from "immediately" to seventeen years. Despite a few (six) cases of many years' interval, the majority (thirty-five) showed the development of a mass within one year of the injury.

It is of interest to note that in every case in which the patient gave any history of trauma the injury was a single, well remembered episode, adequate, as described to the physician, to produce considerable tissue damage. This contrasts with the vague history of a "blow on the breast," or "irritation from a corset," so often vouchsafed by the cancer patient.

Careful review of our cases fails to show any consistent difference in clinical findings between the cases in which there has been a traumatic etiology and those in which there has not. There is no significant difference in the average weight of the two groups; such slight difference as does exist disagrees with the findings of previous observers, for the patients who developed their masses without preceding trauma average 155 pounds in comparison with the 160 pound average of the group with a positive history of trauma. It is therefore certainly not reasonable to presuppose an element of vascular stasis from the "heavy, pendulous breasts" in the non-traumatic group as a form of pseudotrauma in order to classify them all under the heading of "Traumatic Fat Necrosis." It would be preferable, as has already been suggested by several writers, simply to dissociate the limiting adjective "traumatic" from the name of this condition.

It would seem logical to designate this disease entity simply by the name, "fat necrosis of the breast," since pathologically the tissue changes are identical with those which may take place elsewhere in the body, namely, in the omentum, in a lipoma or in the subcutaneous fat. The clinical importance of the condition of which we are writing is derived chiefly from its location in an organ especially susceptible to tumor formation of many kinds, including cancer, with its necessity for prompt and radical surgery.

Although fat necrosis has been produced experimentally with success for a good many years,[7] and although we know a good deal about the mechanism of its production in laboratory animals, the etiology in man is not known. Unquestionably trauma is one predisposing factor, as indicated by the 40 per cent incidence in the forty-five cases reviewed by Hadfield in 1930, and by the 37 per cent incidence of trauma in this series of 110 cases. Apparently obesity is also a factor though not as important a one as previously thought. In our present series, we have no evidence that chronic infection plays a rôle, since these patients showed a somewhat less than average incidence of bad teeth, infected tonsils, gallbladder or pelvic disease. Two of the patients presented the syndrome of Weber-Christian's disease, and in their cases the etiology of the lesions in the breast would presumably be the same as that of similar lesions elsewhere. In the other 108 patients, the mass in the breast or in the mastectomy scar, as it occurred in three, was apparently an entirely localized phenomenon. These patients showed no similarity of constitutional type nor any associated lesions to suggest any widespread metabolic derangement. Of the twenty-three patients who have been followed for five years or more, not one has shown a repetition of the process.

Pathology. The pathology of this condition has been fully described by Ewing in our original article and by other writers, and we shall not enter into any further discussion of it here. We should, however, like to recall Dr. Ewing's[1] able description of the confusing similarity between the gross and sometimes even the microscopic features of fat necrosis and carcinoma. It is true that at certain stages in the life history of fat necrosis the gross diagnosis can be made with certainty by the general surgeon; this fact, however, should not lead to a dangerous overconfidence. Fat necrosis may assume a variety of appearances; the surgeon should always bear in mind that the differentiation from carcinoma may be a difficult one even for the experienced tumor pathologist. Clinically it is as important to the patient that the breast containing only an area of fat necrosis be preserved as that the entire breast which has contained a carcinoma be removed. There is no room in either case for uncertainty in the diagnosis or correct surgical procedure.

Clinical Signs. In our entire series of 110 cases, the patient herself found "a lump" in the breast and came to the Memorial Hospital either directly or through referral by her local physician because of the mass. In only thirty-eight cases was there any associated pain, and in eighteen of these the pain immediately followed trauma, the mass persisting after all pain had subsided. In only eight cases was the mass first noticed because of pain. The most consistent physical finding was that of skin attachment. This was found in sixty-four cases, or 58 per cent. This is of particular interest, of course, since attachment to skin is one of the leading signs in the differential diagnosis of cancer from other tumors of the breast. Attachment to the deeper tissues was found in only nine cases, and elevation or retraction of the nipple was noted in only fourteen. Ecchymosis was observed in twenty-four cases, or 22 per cent; twenty-one of these twenty-four patients gave a definite history of trauma. Two patients without any history of trauma, however, showed quite marked ecchymosis, and one of the cases of panniculitis had a bluish discoloration of the overlying skin. Ten other women showed definite redness of the skin, two in the traumatic and eight in the non-traumatic group. In thirty-one women, or 29 per cent, the axillary nodes showed sufficient enlargement to warrant description, but in only nine cases were these thought to be metastatic. This is, however, a higher incidence of suspicious appearing axillary nodes than has been previously described. In size, the masses varied from ½ cm. to 10 cm. in the greatest diameter; and in consistency they were variously described as hard, firm, rubbery, elastic, cystic and soft.

Provisional Diagnosis. The provisional diagnosis was made in each case by a specialist on the Breast Service. The variety of these diagnoses illustrates better than anything else the wide range of forms fat necrosis may assume.

In seventeen cases, fat necrosis was correctly diagnosed at the first visit to the clinic. Twelve of these patients gave a history of accidental trauma to the breast, and three others had had operative procedures done. The diagnosis of fat necrosis was made on only two patients in the absence of a traumatic history. In six other cases, fat necrosis was given as a second possibility; of these, five had a history of trauma and one did not. This means that only 15.5 per cent of the 110 cases were correctly diagnosed before aspiration or excision, in spite of a 37 per cent incidence of a positive traumatic history. Inclusion of those cases in which fat necrosis was considered as a second possibility raises this percentage only to 21 per cent.

Cancer was diagnosed in thirty cases, twenty-six times as primary operable carcinoma, three times as recurrence in scar and once as metastatic disease on the chest wall after a radical mastectomy. The diagnosis of cancer was made in five pa-

tients even though they gave a history of trauma and in five other patients who had had previous breast surgery. Cancer was considered the second most likely diagnosis in an additional nineteen cases, eight of whom had a history of trauma and one of whom had had breast surgery. In our 110 cases then, forty-nine or 44.5 per cent resembled cancer sufficiently to necessitate a differential diagnosis; the remaining sixty-one resembled various benign conditions.

Among the benign diagnoses we find fibroadenoma occurring fifteen times, chronic mastitis fifteen times, cyst sixteen times, sebaceous cyst three times, abscess three times, neurofibroma twice, and galactocele, lipoma, cystosarcoma, duct papilloma, stasis and cutaneous neurofibromatosis once each. In three cases no diagnosis was suggested.

Operative Procedures. In twenty-two cases, aspiration biopsy alone was done. In twenty-seven cases, there was aspiration followed by local excision. Local excision without preceding aspiration was performed in fifty-seven cases. In one woman with enormous breasts, bilateral simple mastectomy was done for symptomatic relief. In one other case, bilateral simple mastectomy was done because of the extent of disease in both breasts. We performed one simple mastectomy with axillary dissection, and one revision of a radical mastectomy.

It is to be observed that in these 110 cases, only two unnecessarily radical operations were done, in marked contrast to our own former experience and that of others (27 per cent of the forty-five cases reviewed by Hadfield, 20 per cent of Menville's twenty-five cases, had radical mastectomies). Of these two, one was the simple mastectomy with axillary dissection under novocain on an eighty year old woman in whom we were mistaken in our clinical diagnosis of cancer; the other was the revision of a radical mastectomy on a patient in whom we erroneously diagnosed recurrence in scar.

Although we did not rely on an aspiration biopsy alone in any case if the clinical course did not show progressive resolution of the mass, still in our hands this diagnostic measure proved a valuable aid. In all cases in which local excision followed aspiration because of persistence of the mass, the local excision confirmed the diagnosis made on aspiration biopsy.

Course. Of the 110 patients in this series, seventy-two, or 65 per cent, were followed for a period of six months or more. Fifty-five cases were seen over a period of one year or more, and twenty-three were followed for five years. With the exception of one woman who was suffering from Weber-Christian disease, and one who had progressive skin changes following *x*-ray therapy and went on to develop a carcinoma sixteen years after local excision of an area of fat necrosis, all the women were free of any evidence of disease in either breast at the time of their last clinic visit. In twenty of the twenty-two patients who had aspiration biopsy without further surgery, there was spontaneous resolution of the mass within a maximum period of three months. The remaining two patients of this group failed their clinic appointments before complete resolution of the mass had occurred. We doubt if a calcified area of fat necrosis would spontaneously disappear.

CASE REPORTS

We are presenting ten of the 110 cases in more detailed form in order to illustrate some of the points we have discussed.

The first case is chosen as a typical case of fat necrosis simulating a benign condition in both history and clinical findings:

S. E., a twenty-two year old unmarried clerk, was admitted to the Memorial Hospital on April 13, 1932, complaining of a lump in the left breast. The patient had accidentally discovered a small lump in the left breast one year before admission. This gave no trouble until four days before she applied at the clinic, at which time she noticed slight pain in this breast for the first time. The patient believed the mass had grown very slightly in

size during the past year. There was no history of any injury to either breast nor of any previous symptoms referable to the breasts. There had been no history of illness and her general health was good.

Physical examination showed the patient to be a well developed young woman, moderately overweight (weight 157 pounds).

The breasts were rather large, but in proportion to the patient's moderate obesity. In the upper, outer quadrant of the left breast near the periphery there was a hard, irregular, flattened mass about 2½ by 2 by 1½ cm. This mass was located subcutaneously and showed slight but definite attachment to the skin. The right breast and both axillae were normal.

Provisional diagnosis: (1) Fibroadenoma; (2) chronic mastitis.

Local excision was performed on May 4, 1932.

A large area of breast tissue was examined by the pathologist. In this tissue were several nodules of yellow fat necrosis with calcification. On section it revealed calcified inflammatory fat necrosis.

There were no postoperative complications; the incision healed by primary union. The patient was followed regularly in clinic until January 4, 1937, when she was discharged with no evidence of disease in either breast.

The second case is selected as a typical case of fat necrosis simulating a malignant condition, but with a definite history of trauma which made the correct diagnosis possible:

M. D., a fifty year old unmarried seamstress, was admitted to the Memorial Hospital on June 15, 1933, complaining of a lump in the right breast. The patient had been struck by an automobile eight months before admission. There was an extensive old laceration of the right upper arm and a severe contusion of the outer portion of the right breast, which remained black and blue for several months. A hard mass developed within the traumatized part of the right breast within the first few hours after the accident, and the patient had noticed no change in this mass during the eight months preceding admission. There was no history of any other difficulty with either breast. Her health otherwise had been good generally.

Physical examination revealed the patient to be a moderately obese, middle-aged woman in apparently good general health. She was short, weighing 150 pounds, and had gained 20 pounds since the accident eight months ago.

The breasts were moderately large and pendulous. The right breast showed a diffuse duskiness in its outer half. In the upper outer quadrant, 4 cm. from the nipple, there was a very hard mass, 5 to 6 cm. in diameter, which showed attachment to the skin. The axilla and left breast were normal.

Provisional diagnosis: One of us made the comment, "If it had not been for the history pointing to traumatic fat necrosis, I should have made the diagnosis of carcinoma."

Aspiration biopsy was performed on August 8, 1934, and the pathological evidence supported the diagnosis of traumatic fat necrosis.

This patient was followed in clinic until July 3, 1939, after which date she consistently failed her appointments. When last seen, on July 3, 1939, there was still "some induration in the outer quadrant of the right breast, but definitely less than previously described."

The third case is presented because it shows fat necrosis simulating a malignant process without any history of trauma. This case was misdiagnosed, aspiration biopsy was done, and the patient was subjected to an unnecessarily radical operation because of our desire to shorten a long operation in an eighty year old patient.

K. G., an eighty year old married woman, was admitted to the Memorial Hospital on November 1, 1936, complaining of a painless lump in the right breast. She had accidentally discovered a lump in the right breast one week before admission. There was no history of injury to the breast. The patient had never had any difficulty with either breast. There was one uneventful lactation fifty-five years before.

The patient had had hypertension for the past fifteen years. Physical examination showed the patient to be a thin little woman in fairly good condition for her age; her blood pressure was 190/100; heart sounds were of good quality with no murmurs and the lungs were clear.

The breasts were small and flabby. In the right breast at 12 o'clock, approximately 10 cm. above the nipple, there was a hard, irregular mass about 2 cm. in diameter. There was

definite skin attachment. There were several hard nodes in the right axilla 1 to 1 to 1½ cm. in diameter. The left breast and axilla were normal.

Provisional diagnosis: Carcinoma of the right breast with metastasis to axillary nodes.

A right simple mastectomy with removal of the lower axillary nodes was performed on November 2, 1936. One per cent novocain anesthesia was used.

The pathological specimen consisted of an atrophic breast with almost no recognizable mammary tissue, together with a portion of the proximal axillary fat. In one area (marked by operator) was a small cystic area in fat. There was no recognizable wall. This area was a few mm. in diameter, irregular, and with some fairly fresh looking blood. The surrounding fat was a trifle firm. In it was one minute poorly outlined greyish area. The balance of fat was light yellow, greasy in texture, though without opaque areas. The axillary fat contained two nodes both consisting of a cortical ring of lymphoid tissue and "a fatty hilum. The pathologist's report stated: "Inflammatory fat necrosis; nodes clear."

The patient made an uneventful recovery from her operation. She was last seen on June 24, 1938, at which time she showed no evidence of disease in the left breast or in the right chest wall.

The fourth case is given because carcinoma with metastasis to very large axillary nodes was considered the probable diagnosis in spite of a history of trauma, with pain and ecchymosis preceding the appearance of the mass. The repeated use of aspiration biopsy saved the patient from unnecessary surgery:

S. S., a forty-eight year old unmarried dressmaker, was admitted to the Memorial Hospital on December 31, 1941, complaining of tenderness, discoloration and mass in the left breast.

Two weeks before admission the patient slipped in her bathtub and fell, striking her left breast against the faucet. There was immediate severe pain in the breast, which the patient alleviated by the application of cold towels. The traumatized area became black and blue within a few hours, and this discoloration became more intense and greater in extent during the following week. The discoloration had gradually faded; the breast was still tender, but no longer spontaneously painful. She felt that the breast was "lumpy" at the site of injury. The patient was "positive" that there was nothing abnormal in the breast before the fall. She gave no history of serious illness and had gone through an uneventful menopause four years before.

Physical examination revealed the patient to be a middle-aged woman in apparently good general health. Her weight was average.

The breasts were moderate, equal in size and symmetrical. There was a diffuse area of greenish-yellow discoloration extending over an area 7 by 8 cm. in the upper half of the left breast. Underlying this area of ecchymosis was a poorly defined, irregular thickening, with two small nodules palpable within the thickened area, each measuring about 1 cm. in diameter, and both showing definite attachment to skin. In the left axilla two enlarged lymph nodes were palpable, measuring from 2 to 2½ cm. in diameter, freely movable, not attached to skin, but hard in consistency. The right breast and axilla were normal.

Provisional diagnosis: The history of injury and the ecchymosis naturally suggested the diagnosis of traumatic fat necrosis. It was believed, however, that the axillary nodes were clinically metastatic carcinoma. Diagnosis was deferred pending report on aspiration biopsy of one of the axillary nodes. On December 31, 1941, aspiration of an axillary node was reported "fat only" on the smear, and "lymphoid tissue only" on the clot. On January 5, 1942, aspiration biopsy was done on the thickened area in the breast. This was reported "fat only" on both smear and clot.

On January 19, 1942, the patient was taken to the operating room with the provisional diagnosis of probable carcinoma of the breast with metastasis to axillary nodes. A local excision of the larger nodule in the left breast was done, and frozen section made from this. Report of the frozen section was fat necrosis. The larger of the two axillary nodes was also aspirated in the operating room, and this material sent down for examination along with the excised breast tissue. When both were reported benign, the incision in the breast was closed.

The pathological specimen consisted of a locally excised mass of breast tissue approximately 8 by 5 by 4 cm. A small skin ellipse

was attached. On section there was an area approximately 1 cm. in diameter situated approximately 1 cm. below the skin surface. It appeared essentially as a liquefied area of fat, somewhat dark and rather soft in its central portion and having almost the appearance of a cystic structure. There were small areas of breast tissue scattered through the mass but no particular changes were noted. The pathological report stated: fat necrosis. Aspiration biopsy of the axillary node revealed lymphoid tissue.

The fifth case is one of fat necrosis following trauma in which the correct diagnosis seemed apparent:

R. J., a fifty-nine year old married housewife, was admitted to the Memorial Hospital on May 29, 1936, complaining of a lump in the left breast. She had been in an automobile accident two weeks before admission, at which time she was thrown violently against the seat in front, striking her left breast. That night she felt a burning soreness throughout the entire left breast and stated that it became black and blue and felt hot. She applied hot compresses with some relief. She had been aware of a tender mass in the breast since "shortly" after the accident. Twenty-five years before admission, a tumor of two years' duration was removed from the left breast, and the patient was told that this was benign. There was a history of two uneventful eighteen-month periods of lactation, twenty-four and nineteen years ago. She suffered with serious illness in the past, but experienced an uneventful menopause seventeen years before.

Physical examination showed the patient to be a healthy appearing woman of average weight (135 pounds); her blood pressure was 180/100; heart sounds were of good quality with no murmurs.

The breasts were of moderate size, the left slightly smaller than the right. There was a healed scar running horizontally in the upper outer quadrant of the left breast. There was a superficial ecchymosis involving the upper portion mainly but including the areola. Underlying this area of ecchymosis just beyond the areolar border, was a rather soft tumor measuring 2½ by 2 by 1 cm. There was definite skin attachment.

Provisional diagnosis: Traumatic fat necrosis.

Aspiration biopsy was performed on May 29, 1936, and the pathologist reported inflammatory fat necrosis.

On June 29, 1936, one month after aspiration, the mass was no longer palpable. The patient was discharged from the clinic three and a half years later with no evidence of disease in either breast.

The sixth case shows the bilateral development of fat necrosis in breasts in which vascular stasis may have played an important rôle:

L. F., a twenty-two year old unmarried salesgirl was admitted to the Memorial Hospital on July 26, 1934, complaining of a painless lump in the right breast. The patient had been markedly overweight as long as she could remember. For the past three years her breasts had been growing progressively larger. The patient's mother was very obese and had very large breasts. Four months ago the patient accidentally discovered a lump in her right breast; this had produced no symptoms. There was no history of trauma or infection. Her general history was negative except for a lifelong obesity. Menarche took place at eleven, and her menstrual history was entirely normal.

The patient was a tremendously obese young woman, weighing 240 pounds. Fat deposits were chiefly in the breasts, abdomen and hips; the wrists and ankles were slim. There were no remarkable physical findings except the obesity, and a soft systolic murmur at the apex of the heart, with frequent extrasystoles. There were no endocrine stigmata beyond the unusual weight distribution.

The breasts were enormous, resting on the patient's thighs when she sat. The breast tissue itself had collected into irregular, nodular masses in the lower portions. The upper part of the breasts consisted of a mere band of skin and fatty tissue. The lower part showed discoloration and evidence of vascular stasis. In the lower, inner quadrant of the right breast was an irregular, lobulated mass 10 cm. in diameter. It was movable and not adherent to the skin. The left breast also contained numerous thickened areas, but there was no tumor so definite as that in the right. There was no axillary adenopathy.

Provisional diagnosis: Fibroadenoma or cystosarcoma of the right breast; bilateral virginal hypertrophy of breasts.

A bilateral simple mastectomy with plastic formation of pseudobreast on each side was performed by August 8, 1934.

The specimens consisted of a right and left breast, the right weighing 4½ pounds, the left 5¾ pounds, removed by partial mastectomy. The cut section revealed no normal breast tissue except a small amount beneath the areola which consisted of ducts only. On sectioning the breasts, diffuse areas of lobulated fat were found throughout, rather firm in some areas, probably due to the fibrous "capsule" of the lobule. On section the specimens revealed diffuse lipomatosis with multiple areas of fat necrosis.

Gross diagnosis: Fat necrosis, with some xanthomatous changes.

A clinic note on March 25, 1935, reports: Breast tissue is soft; breasts are completely healed; the right breast is slightly larger; there is no tendency to increase in length.

The seventh case is one of fat necrosis with associated echymosis and pain, occurring in a thin woman without any history of trauma.

E. O., a forty-one year old married machine operator, was admitted to the Memorial Hospital on March 19, 1943, complaining of a tender lump in the left breast. When she wakened in the morning two days previously, the patient noticed that her left breast was lumpy and sore. There was no history of injury and she had had no previous trouble with either breast. The patient had a normal pregnancy thirteen years before, but did not nurse the baby due to inadequate milk supply. She had had no serious illness; her general health was fairly good, but she was not vigorous. Physical examination revealed the patient to be a pale, undernourished woman looking several years older than her stated age. She weighed 101 pounds; her teeth were carious with moderate recession of the gums; there were no other positive physical findings.

The breasts were small, equal and rather pendulous. The skin of the left breast was yellowish, giving the appearance of a regressing hematoma of the breast with a central area at 11:30 o'clock moderately hemorrhagic. In this area there was a slight fusiform swelling in fat, and a visible cirsoid swelling on the axis of 12 o'clock, 2 cm. beyond the areolar border. No axillary nodes were present. The area on transillumination was definitely opaque.

Provisional diagnosis: Duct papilloma with stasis and spontaneous rupture of a blood vessel.

Aspiration biopsy was performed on March 22, 1943. A few connective tissue cells only were present. Local excision was carried out on April 13, 1943.

The specimen consisted of an elliptical portion of skin measuring 6 by 3½ cm., together with a small portion of underlying breast tissue. Just beneath the skin was a small cystic area 1½ cm. in diameter. It was filled with chocolate brown semi-solid fluid. The adjoining breast tissue appeared normal. On section fat necrosis with foreign body reaction and hemorrhage with secondary cystic degeneration was noted.

No postoperative complications occurred. The patient was last seen in the clinic on April 27, 1944, at which time there was no evidence of disease in either breast.

The eighth case (Case 104) is of fat necrosis in a girl of fifteen, with nothing in the history or physical findings to suggest the correct diagnosis.

R. P., a fifteen year old high school student, was admitted to the Memorial Hospital on January 18, 1945, complaining of a lump in the left breast. She had noticed a slight pain in the left breast two months before admission. She examined the painful area and found a small lump. She did not believe the lump had changed in size since first noticed. Only slight tenderness persisted at the time of admission. There was no history of injury to either breast and no previous symptoms referable to either breast. This young girl had been in good health all her life, with no history of serious illness. Menstrual periods had been regular since onset two years previously. Physical examination revealed a normally developed young girl, weighing 125 pounds. She appeared to be in very good general health.

The breasts were of moderate size, symmetrical and erect. The nipples and areolae showed a normal virginal appearance. On three o'clock axis in the left breast, at the lateral border of the areola was a 1 by 1 by 1 cm. mass, discrete, freely movable, slightly tender and of elastic consistency. There was no evidence

of attachment to skin. The right breast and both axillae were normal.

Provisional diagnosis: Fibroadenoma.

Local excision was performed on January 19, 1945. The specimen consisted of an irregular, rather firm mass of translucent breast tissue measuring 2 cm. in its greatest diameter. In one area a small rounded opaque yellowish focus was seen. The section revealed fat necrosis.

The ninth case is presented to illustrate the deceptive appearance of fat necrosis occurring in a mastectomy scar. This was one of three similar cases in our series. Such lesions are not rare following radical mastectomy.

N. F., a fifty-seven year old unmarried teacher, was admitted to the Memorial Hospital on August 1, 1939, complaining of three hard lumps in a mastectomy scar. In October, 1937, the patient had a left radical mastectomy for cancer. She did not have postoperative *x*-ray therapy. In June, 1938, she had a right simple mastectomy performed for chronic cystic mastitis. Shortly after this second operation, she noticed a small tender firm mass in the lower portion of the radical mastectomy scar. This increased slightly in size, and two other similar nodules appeared in the two months preceding admission. The patient had had no serious illness or operation except those performed on the breasts. Her general health was good. Physical examination revealed a fairly well developed and well nourished middle-aged woman in apparently good general health. Her blood pressure was 130/92.

Both breasts had been removed, the right by a simple, the left by a radical mastectomy. In the lower third of the left mastectomy scar was a hard, non-tender mass, just under 1 cm. in diameter, adherent to skin. There was a similar, slightly smaller mass in the axillary portion of the scar, and a third hard nodule in the upper left arm, 2 cm. away from the incision. There was no evidence of disease in either axilla, supraclavicular or infraclavicular areas.

Provisional diagnosis: Recurrent carcinoma in scar.

Local excision was performed on August 2, 1939.

Pathological specimens consisted of three areas: Area No. 1 was a skin ellipse 6 by 4 cm. with 2 cm. of underlying fat tissue in the center of which was an irregular, non-circumscribed, discoid mass, yellowish-white in color, with peripheral radiating strands and typical chalk streaks of carcinoma. No description was given of areas Nos. 2 and 3. On section of areas 1, 2 and 3, there was fat necrosis.

The tenth case is that of relapsing febrile, nodular, non-suppurative panniculitis.

L. K., a thirty-six year old married woman, was admitted to Memorial Hospital on March 23, 1937, complaining of swelling and lumps in both breasts. Two months before admission the patient developed the first lump in her left breast. There was associated redness and swelling of the surrounding skin but no pain. Two weeks following this first lump, a similar mass appeared in the right breast, starting as a swollen soft lesion, covered with reddened skin, and gradually subsiding to a discrete hard nodule. Two subsequent masses appeared in the left breast, running an identical course. There was no history of trauma to the breasts. There had been one period of several months' lactation, and a two-week period with the second child, terminated because of "caked breasts." She had suffered with polyarthritis with chills and fever six years before. She also gave a history of painless subcutaneous nodules two years before, distributed over entire body, but especially on the lower extremities.

The patient was an obese young woman, not appearing ill at the time of examination. Most of her teeth had been recently extracted because of pus pockets. The tonsils were embedded and her blood pressure was 160/100. In the middle of the right calf there was a subcutaneous area, firm, non-tender, measuring 1 by 1½ cm., attached to the skin. There were no other masses except those in the breasts but there were scattered macular skin lesions over the lower extremities, not typical of petechiae.

The breasts were large and pendulous. The right breast showed a slight bluish discoloration on 12 o'clock axis 8 cm. from the areolar margin. Underlying this area was a firm mass, 2½ by 3 cm., attached to skin. In the tail of the right breast was a similar mass, 2½ by 2 cm., also with skin attachment. There was a tender, movable node high in the right axilla, 1 cm. in diameter. There were three obvious deforming

lumps of the left breast, located respectively at 11, 12:30, and at 2 o'clock axis. The first of these to appear was firm and discrete; the second and third were cystic in consistency and showed reddening of the overlying skin. There was a soft 1½ cm. node, freely movable, in the left axilla.

Provisional diagnosis: Multiple cysts, bilateral. The note was made, when this patient was first seen in the clinic, that it was an unusual case and each of the breast masses was to be aspirated to make sure of the contents.

On March 25, 1937, aspiration biopsies were done on five breast masses and on the nodule of the right calf. All these specimens showed thick mucoid material with rare leukocytes. The specimen was negative for acid fast bacilli nor was there any suggestion of tubercle structure. Cultures showed no growth by the fourth day.

On March 29, 1937, a new and similar nodule appeared in the left popliteal space. On April 9, 1937, the patient was admitted for excision of one of the breast nodules and one on the extremities. A local excision of the mass from the upper inner quadrant of the right breast was performed on April 12, 1937.

The specimen consisted of a mass of fatty breast tissue 3 by 2 by 1½ cm. in size. One portion showed a cystic cavity with yellowish necrotic walls 1 cm. in diameter. Gross diagnosis: Fat necrosis. On section it showed inflammatory fat necrosis.

During the four and one-half years that this patient was followed in the clinic, she developed nodules in the right hip, the right arm, the right groin, the left elbow and in the left axilla. The last nodule was observed in the left breast on January 9, 1941. The patient was seen on two subsequent occasions and no masses were found in either breast. She was last seen on December 8, 1941, and disappeared thereafter.

CONCLUSIONS

1. There is no reasonable basis for retaining the qualifying word "traumatic" in the name of the disease which was first described by us as "traumatic fat necrosis of the breast."

2. The best designation for this clinical entity would seem to be the self-explanatory "fat necrosis of the breast," which tells what it is, where it is, and emphasizes the fact that an identical process is concerned whether it is taking place in mammary fat, in the omentum or in adipose tissue anywhere else in the body.

3. The etiology of fat necrosis of the breast is not known. Trauma, accidental or surgical, is the single most important predisposing factor known at the present time, occurring in nearly 40 per cent of all cases. In our series, a blow on the breast was the apparent predisposing factor twice as often as was the surgical trauma of an operative procedure.

4. The only difference between the forty-one patients who gave a history of trauma compared in a group with the sixty-nine who did not, was the increased incidence of ecchymosis in the traumatic group. All other clinical signs, gross and microscopic pathological findings and subsequent course showed no correlation with positive or negative history of trauma.

5. No correlation has been found between the occurrence of fat necrosis and any constitutional type. Chronic infection as a possible predisposing factor can be ruled out.

6. The importance of obesity, either of the individual or relatively of the breasts themselves, is somewhat less than was previously emphasized although fat necrosis is more apt to occur, with or without preceding trauma, in the overweight group.

7. The lesions of relapsing febrile nodular non-suppurative panniculitis (Weber-Christian disease) as they appear in the breast are indistinguishable from fat necrosis arising in the absence of this syndrome.

8. The clinical signs of fat necrosis of the breast are more variable than has been previously described. The commonest and most confusing sign is attachment to the skin. This is found in about 60 per cent of cases.

9. Approximately 45 per cent of cases of fat necrosis resemble cancer sufficiently closely to make necessary a careful differentiation between the two conditions; in the remaining 55 per cent of cases, widely

differing benign conditions may be simulated. In only 20 per cent of cases was the correct diagnosis suggested by the history or physical signs.

10. Positive diagnosis can be made only by gross and microscopic examination of excised tissue. This is not necessary in all cases, but should be resorted to in the case of any patient in whom there is any doubt whatever that the lesion in question may be a malignant one.

11. Despite the recognition of an increasing number of cases which do not resemble mammary cancer, fat necrosis of the female breast retains its importance to the clinician because of the remarkable similarity it may bear to carcinoma, not only in physical signs but on gross appearance of cut tissue in the operating room.

12. In closing, let us emphasize once more that no woman should be subjected to the mutilating operation of radical mastectomy unless the presence of a malignant tumor has first been proven.

REFERENCES

1. Lee, B. J. and Adair, F. *Ann. Surg.*, 72: 188, 1920.
2. Lee, B. J. and Adair, F. *Surg., Gynec. & Obst.*, 34: 521, 1922.
3. Lee, B. J. and Adair, F. *Ann. Surg.*, 80: 670, 1924.
4. Hadfield, G. *Brit. J. Surg.*, 17: 673, 1930.
5. Menville, J. G. *Am. J. Cancer*, 24: 797, 1935.
6. Dunphy, J. E. *Arch. Surg.*, 38: 1, 1939.
7. Farr, C. E. *Ann. Surg.*, 77: 513, 1923.
8. Binkley, J. S. *J. A. M. A.*, 113: 113, 1939.

Malignant tumors of the breast grow more rapidly and are a greater hazard during pregnancy. In general, the younger the individual, the more rapidly a cancer of the breast will grow. This rapidity of growth makes the prognosis more grave in this group.

From "Operations of General Surgery" by Thomas G. Orr (W. B. Saunders Company).

EXPERIENCES WITH BONE GRAFTING PROCEDURES FOR THE TREATMENT OF BATTLE CASUALTIES AND WAR INJURIES

LIEUT. COL. BYRON B. KING
U. S. Army General Hospital Orthopedic Section
CAMP EDWARDS, MASSACHUSETTS

BONE grafting procedures have been performed at the U. S. Army General Hospital, Camp Edwards, Mass. in one hundred instances from May, 1945, to December, 1945, an eight month period. This is by no means an end result study, since patients are relatively soon lost sight of in military installations. The types of patients dealt with in this group were somewhat different than those ordinarily seen and treated in civilian life. As a group these subjects were characterized by severe compound fracture and comminution of bone with an associated bone and soft tissue infection while in many cases there was marked soft tissue loss and fibrosis. Shell fragment wounds which these patients sustained resulted in varying degrees of comminution of bone. Usually there was an associated extensive wound of the soft tissues and the majority of the patients presented post-traumatic osteomyelitis upon their arrival at the hospital.

While overseas these injuries had been treated by débridement, skeletal traction, plaster immobilization and chemotherapy in the form of penicillin and sulfonamides. Open reductions had been performed on some of the fractures and split-thickness or full-thickness skin grafting procedures and secondary closures had been done in many other instances. Of the one hundred patients under consideration, ninety-one (91 per cent) had sustained compound fractures; most of these were comminuted. Nine (9 per cent) had sustained simple fractures while one of these nine had undergone a previous open reduction. Table 1 lists the relative involvement of the various bones and joints involved. The average age for the group was twenty-six years, the youngest patient being nineteen years of age and the oldest thirty-nine years of age. All the patients were males. Table 11 lists the various indications for undertaking bone grafting procedures in these patients.

TABLE 1
RELATIVE INVOLVEMENT OF BONES AND JOINTS WHICH REQUIRED BONE GRAFTING PROCEDURES

	Per Cent
Femur	37
Tibia	25
Humerus	10
Humerus and shoulder	2
Ulna	8
Radius	7
Radius and ulna	2
Clavicle	1
Ankle	5
Elbow	3
	100

Forty-eight hours prior to operation, except in the case of the nine simple fractures, the use of systemic penicillin was instituted. Twenty-five thousand units were given intramuscularly every three hours and this was continued for two weeks following operation. Two teams of operators worked together in most cases. Two operators were engaged in removing a massive tibial graft or an iliac graft, while two other operators exposed the fracture site and prepared the bed for the graft. Intravenous fluids, including 5 per cent glucose in normal saline solution, plasma and whole blood were given routinely during the operative procedure. A fracture table which enabled the application of traction was used to great advantage in grafting the femurs. When tibial bone was utilized as a graft, it was believed that the best type of incision was one which ex-

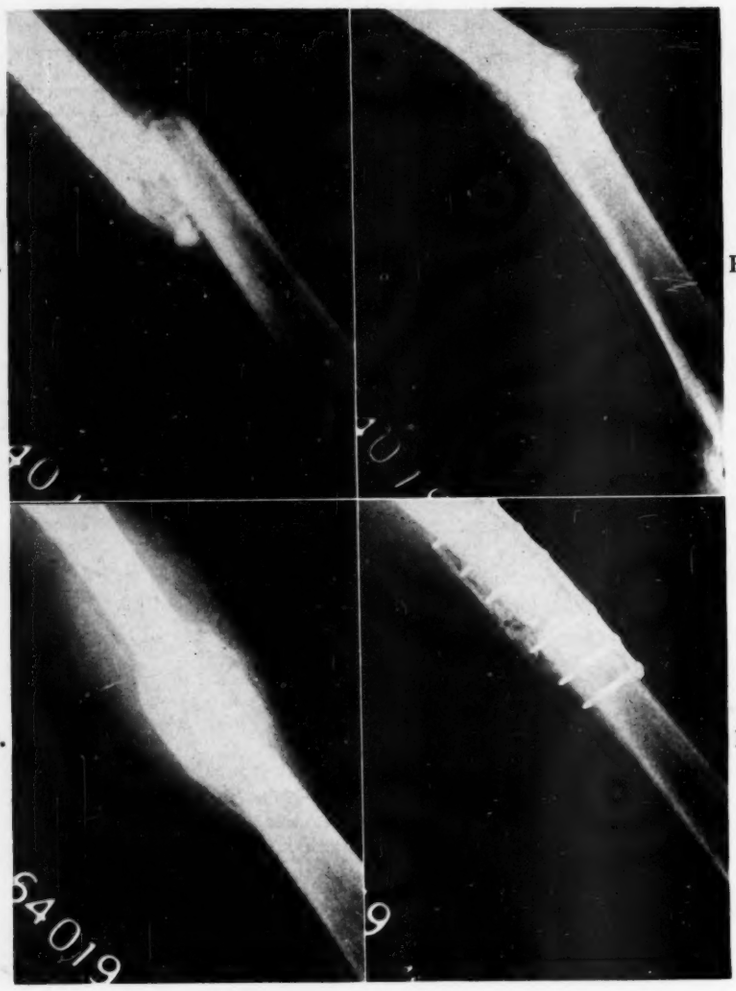


Fig. 1. Cpl. C. Compound fracture of mid-shaft of left femur was sustained April 17, 1945, in a plane crash; non-union resulted; preoperative anteroposterior view.

Fig. 2. Cpl. C., preoperative lateral view.

Fig. 3. Cpl. C. Six-screw plate and right iliac bone were applied July 16, 1945; postoperative anteroposterior view.

Fig. 4. Cpl. C., postoperative lateral view.

tended from the region of the tibial tubercle to the lower end of the bone and passed down the lateral border of the crest of the tibia, being so placed that it lay ¼ inch lateral to the tibial crest. The periosteum was then reflected and the full-thickness cortical graft was removed from the anteromedial surface of the tibia with the motor saw. Additional cancellous bone was then removed from the proximal portion of the bone with a curette. The tibial grafts varied in size, some of them measuring up to 9 inches in length. While iliac bone was used, often the anterior superior spine and both tables of the crest were removed as a single piece 4 or 5 inches in length. The greater portion of the outer table of the ilium was utilized as slabs of bone of varying sizes and additional cancellous bone was obtainable with a curette. The fracture site was exposed through an adequate incision and the scar tissue which had formed between the bone ends and comminuted fragments was excised as completely as possible. The eburnated bone ends were rongeured back to healthy

appearing bleeding bone and the medullary canals were re-established. The bed was then prepared for the graft which was maintained in position with 18-8 SMO stainless steel screws. Additional cancellous bone and bone chips were then packed about the fracture site. Following operation the patient was immobilized in a plaster cast or spica except when the femur had been reinforced with a bone graft. In the latter case, a Kirschner wire was passed through the upper end of the tibia at the level of the tuberosity and 15 pounds traction suspension was instituted. Following this quadriceps exercises were begun immediately while knee motion was usually started approximately six weeks following operation. The period of post-operative immobilization averaged twelve weeks for the larger bones and slightly less for the smaller bones. It was considered advisable to use ischial caliper braces for many with grafted femurs when they became ambulatory. It was also found advisable to protect the donor tibia with either a short leg walking cast or a short leg brace after the patient became ambulatory.

Table III lists the various types of bone grafts that were performed in this series. The majority (43 per cent) were tibial onlay grafts. Thirteen per cent dual grafts were accomplished and in 20 per cent stainless steel plates were used in addition to bone. The tibia was utilized as the source of bone in 77 per cent, the ilium in 17 per cent, the tibia plus the ilium in 7 per cent, and the fibula in 1 per cent. One hundred two bones were grafted in the one hundred patients as there were two patients who had both the radius and ulna grafted.

TABLE II
INDICATIONS FOR BONE GRAFTING PROCEDURES IN THIS SERIES OF CASES

	Per Cent
Non-union	54
Bone defect	16
Frail union with mal-union	15
Frail union	7
Bone cavity	1
Shattered joint	7
	100

Table IV lists the various complications encountered. Complications of one sort or another were encountered in 40 per cent of the patients. Postoperative recurrence of wound infection occurred in 21 per cent; 6 per cent of these were classified as major infections and 15 per cent as minor infections. Ninety-one per cent of the patients had compound fractures to begin with and many were complicated with moderate to severe degrees of post-traumatic osteomyelitis which often required one or more sequestrectomies or saucerizations to produce healing of the wounds. Many of the

TABLE III
VARIOUS TYPES OF BONE GRAFTS EMPLOYED

Tibial onlay	43
Plate plus iliac bone	12
Tibial recess	8
Tibial inlay	6
Sliding tibial inlay plus plate	5
Iliac recess	3
Sliding tibial inlay	2
Dual, tibial onlay and tibial inlay	2
Dual, tibial onlay and sliding tibial inlay	2
Dual, tibial onlay	2
Dual, tibial onlay and iliac inlay	2
Tibial onlay plus iliac bone	2
Tibial onlay—intramedullary	2
Dual, tibial onlay and tibial recess	1
Dual, tibial recess and tibial intramedullary	1
Dual, tibial onlay and iliac onlay	1
Iliac onlay	1
Dual, tibial inlay with plate and tibial onlay	1
Dual, tibial intramedullary plus Smith-Petersen nail	1
Tibial recess plus iliac bone	1
Tibial intramedullary plus iliac bone	1
Plate plus tibial bone	1
Iliac recess plus plate	1
Proximal fibula (for distal ulnar loss)	1
	102

TABLE IV
VARIOUS COMPLICATIONS ENCOUNTERED

	Per Cent
Recurrences of wound infections following bone grafting	21
Major infections	6
Minor infections	15
Fracture of bone graft	8
Refracture of femur	1
Fracture of donor tibia	5
Following operation	3
At operation	2
Slipping of bone graft following operation	3
Temporary tourniquet paralysis	2
Total complications	40

Fig. 5. Fig. 6. Fig. 7.

Fig. 5. Cpl. D. Compound comminuted fracture of junction of middle and lower thirds of left radius was incurred April 12, 1945, due to shell fragment wound; preoperative anteroposterior and lateral views.

Fig. 6. Cpl. D. Left tibial recessed graft was done on July 23, 1945, because of frail union; postoperative anteroposterior view.

Fig. 7. Cpl. D., postoperative lateral view.

patients presented marked soft tissue loss and scarring with resultant circulatory impairment. The problem of how long to wait after the healing of a previously infected wound before bone grafting procedures are performed is a difficult one. The advent of chemotherapy has shortened the time interval but in many instances the previous infection will flare up in spite of its use. No bone grafting procedures were attempted until the soft tissue wounds had remained healed for one and one-half months or longer. It was believed that each patient presented an individual problem. The severity of the preceding infection involving the bone and soft tissues had to be taken into consideration and the condition of the soft tissues overlying the fracture site had to be evaluated. If the previous infection had been severe or if extensive fibrosis and circulatory impairment of the soft tissues had resulted it was believed advisable to wait longer before doing the bone graft. In the case of the tibia the application of a full-thickness skin graft over the involved bone was found to be imperative.

For the entire series an average of 3.5 months elapsed between the time of the healing of the soft tissue wound and the bone grafting procedure. This interval varied from one and one-half to thirteen months. Of the six patients who develop major infections following operation one subsequently required a below the knee amputation. This patient had presented a massive loss of the distal half of the tibia, and a dual tibial graft was performed. Following the original injury he suffered a rather severe post-traumatic osteomyelitis which had entirely healed four and one-fourth months before the bone graft was performed. Also following the original injury he sustained gangrene of the distal portion of his foot which resulted in the amputation of all his toes. In retrospect, it would have been wiser perhaps to have performed the below the knee amputation

Fig. 8. Sgt. E. Compound comminuted fracture of proximal third of shaft of right femur was sustained January 30, 1945, as a result of rifle fire; nonunion resulted; preoperative anteroposterior view.

Fig. 9. Sgt. E. An eight-inch, left tibial onlay graft was applied August 24, 1945; postoperative anteroposterior view.

in the first place instead of attempting a bone graft. Two patients had bone grafting procedures done to the proximal portions of the tibia. Both of their wounds, which had previously been badly infected, broke down with a resultant partial loss of the bone graft. Of these, one bone graft was performed one and three-fourth months after wound healing had occurred; the other was done four and one-half months after the wound healed. Both patients required further sequestrectomies and application of split-thickness skin grafts. Both wounds healed and will very likely not require further bone grafting. One ununited femoral fracture which had been treated by the application of a massive tibial onlay bone graft developed a profuse postoperative drainage. The wound had healed five and one-fourth months before the bone graft was performed. Several sequestrectomies were necessary and the larger portion of the bone graft was removed eventually as a sequestrum. Another ununited femoral fracture had presented a purulent discharge for three and one-half months following the original fracture. A massive tibial onlay bone graft was done two and one-fourth months after healing occurred but the original sinus tract reopened following operation and a sequestrectomy without removal of the graft was required. The last major infection was a patient with a large cavity at the proximal end of the tibia. This had previously been treated by several sequestrectomies followed by the application of split-thickness skin grafts. One and three quarter months after the wound was healed, an incision was made laterally through healthy tissue and the periosteum and soft tissues overlying the bone cavity were elevated and the cavity filled with tibial and iliac bone. Following operation this wound broke down with a subsequent loss of the bone grafts and the split-thickness skin graft. After the infection has subsided this patient will require a full-thickness skin graft followed by further bone grafting procedures. Fifteen per cent of the subjects developed minor postoperative wound infections. Nine of these have healed while and one is healing with conservative treatment. Five patients

required the removal of screws and sequestrectomies they are in the process of healing.

Eight per cent of the patients sustained a fracture of the bone graft. All of these were massive tibial onlay grafts; six had been applied to femurs, one to a humerus and one to an ulna. One bone graft fractured four months following operation while the patient was walking without a brace; the second fractured in a similar manner three and one-fourth months following operation; the third became fractured when the patient fell four and one-fourth months following operation; the fourth fractured seven weeks following operation while the patient was still in traction suspension. The graft was fractured when the patient was lifted by the *x*-ray technician to slip a cassette under the thigh; the fifth sustained a fracture of the graft twelve weeks following operation when the overhead frame fell as he was being removed from traction. In three of these patients loss of position with bowing occurred and an open reduction was performed in each case with the application of a bone plate and iliac bone reinforcement. The fifth patient suffered no loss of position and was returned to traction suspension. In the sixth case a dual tibial onlay graft was applied to the distal end of the femur. At the end of twelve weeks following operation the patient was removed from traction. At that time the roentgenogram revealed fractures of the grafts without loss of position. The seventh case had a massive tibial onlay graft applied to the humerus. The shoulder spica was removed eleven weeks following operation and *x*-rays at that time revealed a fracture of the graft without displacement and with adequate callus formation. The eighth patient had a dual tibial onlay graft to bridge a defect in the ulna. *X*-rays taken fourteen weeks after operation revealed a healed fracture of both grafts with solid bony union; this had occurred while the arm was immobilized in a long arm cast. Residual angulation may require an osteotomy for correction.

One patient who had the application of a massive tibial onlay graft to the distal end of the femur had remained in traction suspension for twelve weeks following operation. Two weeks later the physical therapist was attempting to increase motion in the knee and the patient sustained a fracture of the shaft of the femur at its junction with the distal end of the graft. There was no loss of position in this case and further traction suspension was instituted.

Five per cent of the patients sustained a fracture of the donor tibia. Two of these occurred at the time of operation when the graft was removed. There was no displacement and healing occurred uneventfully. Three per cent of the patients sustained donor tibial fractures following operation. All three were unprotected by a brace or cast at the time of the fracture. One fracture occurred four and one-fourth months after operation when the patient slipped and struck his leg against the running board of an automobile, and the second occurred four months after operation when the patient was jumping vigorously during exercises in the reconditioning gymnasium. Both of these patients presented no displacement and were treated by further immobilization. The third patient had a small graft 2½ inches in length removed from his tibia for the grafting of a non-union of his clavicle. One month following operation he jumped off a step and sustained a compound fracture of the tibia which necessitated an open reduction.

Three per cent of the patients evidenced a slipping of the graft following operation with the resultant loss of position. All three had massive tibial onlay grafts of the femurs and all three were in traction suspension. By altering the traction apparatus, two of the patients were completely realigned while the third was improved sufficiently to insure satisfactory, although not anatomical, alignment.

Two per cent of the patients sustained a temporary tourniquet paralysis of the donor leg. Function returned to normal in both.

SUMMARY AND CONCLUSIONS

One hundred bone grafting procedures have been performed during an eight-month period. Ninety-one per cent of these patients presented compound fractures which were extensively comminuted in most instances, and sixteen per cent resulted in a massive loss of a portion of the entire shaft of the bone involved. The wounds were characterized by varying degrees of post-traumatic osteomyelitis and soft tissue loss and fibrosis. Complications were encountered in 40 per cent of the patients. There were 21 per cent recurrences of wound infections following operation. Six per cent were classified as major infections and 15 per cent as minor infections. Eight per cent of the bone grafts became fractured; 3 per cent required surgical correction and 5 per cent required only further immobilization. Three per cent donor tibias were fractured when the patients became ambulatory. Sixty per cent of the patients have had an uneventful convalescence to date but end result studies are impossible in this series of cases.

The major problem has been that of avoiding a postoperative flare-up of a preceding infection of bone and soft tissues and it is felt that the condition of the overlying soft parts is of the greatest importance. In many cases adequate full-thickness skin grafting of granulating or scarred surfaces as a preliminary step is of major importance in decreasing the incidence of postoperative infections following subsequent bone grafting procedures.

The use of systemic penicillin before and after operation has lessened the time interval between the healing of the original wounds and bone grafting procedures. However, recurrences of infection in bone will occur in spite of its use. The average time interval allowed to elapse between healing of the original wounds and subsequent applications of bone grafts averaged 3.5 months in this series of patients.

TREATMENT OF LARGE VENTRAL INCISIONAL HERNIA*

HERMAN A. PINK, M.D.
PITTSBURGH, PENNSYLVANIA

VENTRAL incisional hernia still poses a major surgical problem. A review of the literature in the last ten years reveals many ingenious methods advocated for hernial repair. Fascia lata as pedicle and free transplant grafts have been used extensively as has preserved beef fascia. The recti muscles have been severed at their pubic insertion, overlapped and sutured to the opposite pubis. Preserved beef fascia has been used over the hernial site being sutured to the fascial edges of the hernia. Extraperitoneal operations have been described with and without excision of the hernial sac, incision into the rectus sheath, folding inward of the rectus fascia and uniting the layers above individually. In the last few years cutis grafts have been utilized for hernial repair.

In 1934, Dr. B. Z. Cashman began utilizing an exceedingly simple extraperitoneal type repair with excellent results. Others in the group have also used this method with similar results. As frequently occurs a careful search of the literature revealed that this technic was not new at all but had been described in great detail by Dr. Irving Haynes of New York in 1913 with a report of seven patients successfully treated. However, no description of this technic nor reference in any detail has been found in the last ten years. Since it has proven of great value in certain large incisional hernias, we believe that this method of repair should again be called to attention as a valuable adjunct in the surgeon's armamentarium. The illustrations in Dr. Haynes' original article are so excellent and clear-cut that it was considered superfluous to make others. The illustrations on technic, therefore, are absolute copies with the original notation from his article.

TECHNIC

The operative technic is quite simple as evidenced by a careful examination of the illustrations. The old scar is excised and usually the hernial sac is found just beneath the skin. The subcutaneous fat is dissected free from the hernial sac by sharp and blunt dissection being careful not to perforate the peritoneum. As much fat as possible is removed from the sac and the dissection is carried wide in all directions until all the fascial boundaries are identified and exposed for a short distance around the hernial ring. Allis forceps are placed at intervals along the hernial ring edges to identify them easily. If the sac is not to be opened, inversion is begun and the sac is inverted in three to four layers using No. 30 stainless steel wire. The sac may be opened and any intra-abdominal work necessary performed followed by peritoneal closure with catgut and inversion with wire in the usual manner. If the sac is quite large in comparison to the size of the hernial ring, a portion of the sac may be excised before inversion and the peritoneal edges reunited with catgut followed by the inverting sutures of wire as usual. The entire procedure is technically quite simple and the inversion is accomplished with surprisingly little tension. Care is maintained, particularly in inverting the first layer, but there has been no damage to abdominal contents in any of the patients. In some subjects with a marked panniculus lipectomy was done following the hernial repair.

RESULTS

There were thirty-one patients operated upon at the Elizabeth Steel Magee and St.

* From the University of Pittsburgh School of Medicine.

Francis Hospitals since 1934. There have been three other cases not analyzed because they were too recent to include. There were no operative deaths in the series (including the three cases not considered) and only one recurrence, insofar as we have been able to trace the patients. Twenty-five subjects were followed from six months to eight years; the others were not traceable one to four months after operation, hence were not seen again.

Only the following interesting and illustrative cases will be considered in detail:

CASE REPORT

Case 1. B. S., a colored female, aged twenty-seven and weighing 206 pounds, was admitted to the Elizabeth Steel Magee Hospital for the first time, August, 1944, with a ventral hernia along the entire length of a suprapubic midline incision. She had had a cesarean section in 1942 after a forty-eight-hour labor. This was followed by an extensive pelvic peritonitis necessitating hospitalization for one hundred days. The hernia occurred soon after discharge and was repaired shortly thereafter, the technic used being unknown. Repair was done again on August 5, 1944, by the inversion technic and the patient had an uneventful postoperative course, being discharged on the thirteenth postoperative day. She was readmitted on the twenty-second postoperative day with a large abdominal wall abscess involving the entire incisional area and necessitating incision and drainage. Despite this massive wound infection there was no recurrence of the hernia.

On November 30, 1946, she was readmitted to the Elizabeth Steel Magee Hospital, eight and one-half months pregnant. A classical cesarean section was done through a right rectus incision made two-thirds above and one-third below the umbilicus to avoid the hernia repair. No difficulty was encountered in performing this cesarean section and no evidence of any recurrence of the hernia could be found. She was discharged well ten days later, although her postoperative course was complicated by an asthmatic bronchitis. In January, 1947, she noted herniation of the recent right rectus cesarean section scar which involved the entire incisional area. She was readmitted to the Magee Hospital in March, 1947, and the new hernia repaired by the inversion technic March 6, 1947. At this time, the repair of the suprapubic hernia was palpated intra-abdominally and was felt as a smooth ridge 1 inch thick and 1 inch wide. This repair at no time showed evidence of weakening. When seen on April 8, 1947, her recent hernial area appeared well healed.

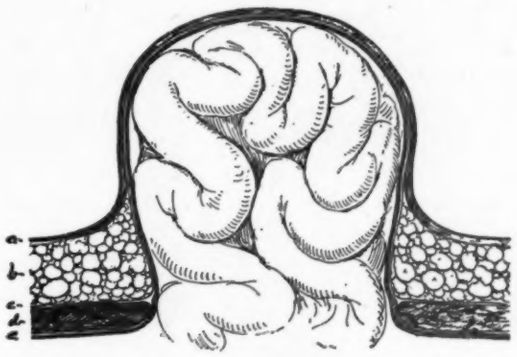
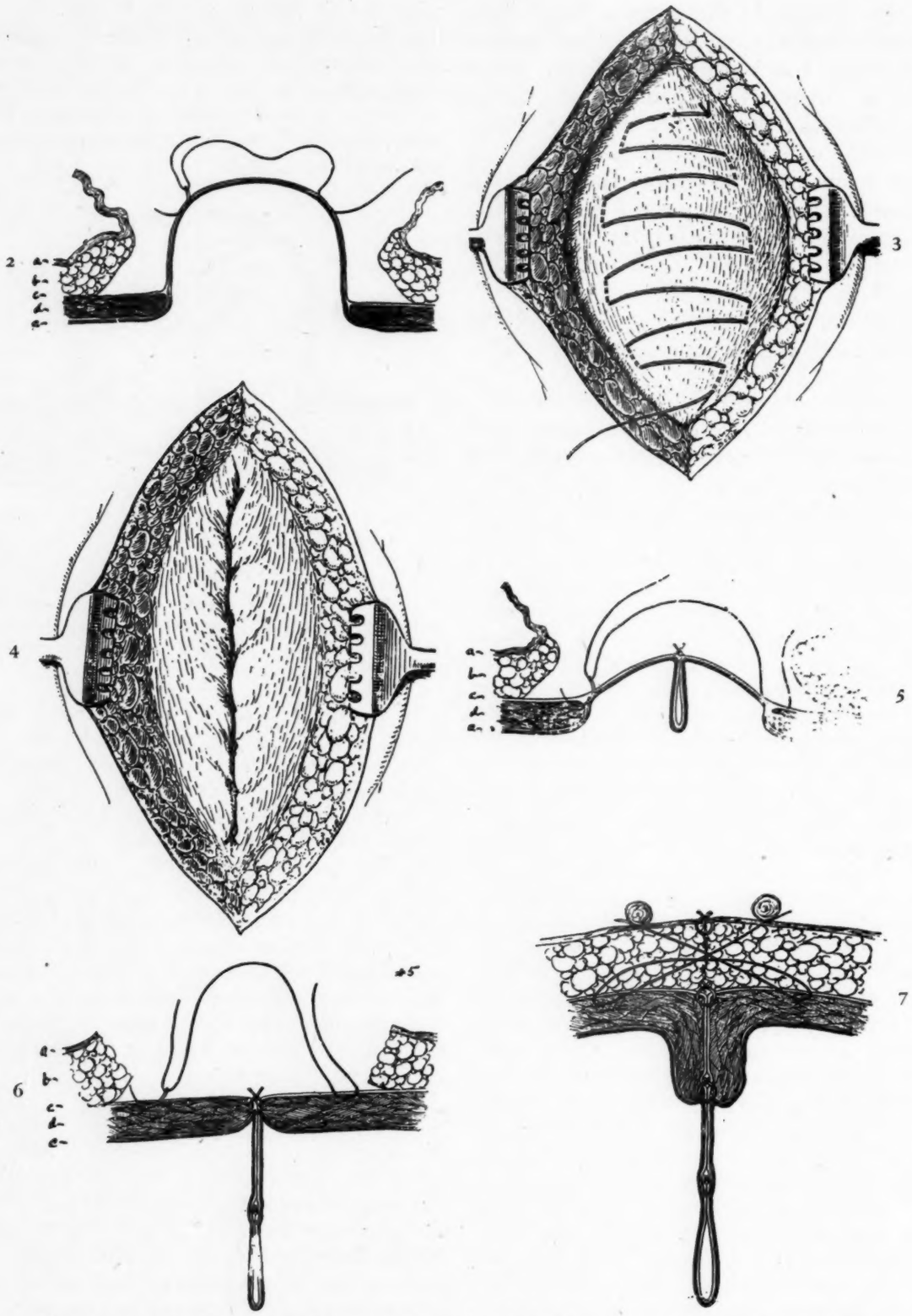


Fig. 1. A sectional view of hernia. The contents may be disregarded; the construction of the sac is the important feature. The different structures are lettered the same throughout: *a*, skin; *b*, subcutaneous tissue; *c*, external fascia covering the abdominal muscles; *d*, muscular layer; *e*, internal muscular fascia and peritoneum.

Case 11. E. A., a white female, aged twenty-four, weighing 175 pounds, was admitted to the Elizabeth Steel Magee Hospital in May, 1942, with an incisional hernia involving an entire right rectus incision. This occurred after a pelvic laparotomy in 1941. On May 15, 1942, the hernia was repaired by the inversion technic, not knowing that this patient was approximately four months pregnant. This was due to the marked obesity which made pelvic examination difficult, and a history of prolonged periods of amenorrhea in the past without pregnancy. She had an uneventful course and delivered spontaneously on September 22, 1942, at the Magee Hospital.

She was seen again in July, 1945, at which time the hernia repair showed no evidence of weakening, but a small umbilical hernia was noted. This was repaired in August, 1945, using the usual Mayo technic. The upper portion of the old hernia repair was palpated intra-abdominally and the ridge of inverted tissue was easily felt and found to be quite solid. She was again delivered at term on January 29, 1946, by low forceps and on the fifteenth postpartum day there was no evidence of recurrence of either hernia.



Figs. 2 to 7. The illustrations from 2 to 7 inclusive depict the steps in the operative treatment when the sac is not opened. Figure 2 shows the skin dissected from the thin sac and the skin and subcutaneous tissue dissected back from the hernial orifice so as to leave a wide margin of the

Case III. M. S., a sixty-five year old, white female, weighing 140 pounds was admitted to the St. Francis Hospital in May, 1944, with a ventral hernia involving the entire suprapubic midline scar. This followed a drained pelvic laparatomy in 1926. This patient had had four repairs of this hernia, the last being in 1942. The technic of these repairs was the usual excision of the sac and reapproximation of the abdominal wall in layers. This patient also had partial intestinal obstructive symptoms. On May 2, 1944, the hernia was repaired with the inversion technic. The sac was opened and intestinal adhesions were separated prior to inversion. Follow-up one and one-half years afterward found her with no evidence of recurrence.

Case IV. C. D., a forty-three year old white female, weighing 285 pounds, was admitted to the Elizabeth Steel Magee Hospital in July, 1942, with a history of ventral incisional hernia repair in 1930. This hernia recurred within a short time after being repaired. On July 29, 1942, this hernia was repaired with the inversion technic and lipectomy performed at the same time. There was no evidence of recurrence three months after operation, but unfortunately, we have not been able to trace this patient further.

Case V. M. C., a thirty-eight year old colored female, weighing 184 pounds, was admitted to the Elizabeth Steel Magee Hospital in February, 1945, with a ventral incisional hernia 8 inches in diameter above the umbilicus. This followed an exploratory laparotomy through a midline incision above the umbilicus in 1937. On March 1, 1945, the hernia was repaired by the inversion technic. Follow-up since then has revealed no recurrence of the hernia.

Case VI. C. M., a fifty year old, white female, weighing 134 pounds, was admitted to the Elizabeth Steel Magee Hospital in August, 1943. The patient had had a second laparotomy through a suprapubic incision in 1942 which was followed by a hernia in the lower third of the incisional area. This extended for a distance of 4 cm. down over the symphysis pubis. A repair by the inversion technic was performed on August 31, 1943. The patient had an uneventful postoperative course but by January, 1945, the lower portion of the hernia had recurred. This was repaired again on April 27, 1945, by excision of the sac and approximation of the abdominal wall in layers. At the time of operation the upper two-thirds of the hernia repair was found to be quite solid and the recurrence was only in the lower third.

COMMENTS

There are interesting data in this series. Sixteen, or one-half of these patients weighed over 180 pounds, one weighing 285 pounds. Three patients were diabetics. Twenty of these subjects were either drained or had a severe postoperative infection preceding the occurrence of the hernia.

In nineteen patients the peritoneal cavity was not opened. In only two patients was it necessary to excise part of the sac. In addition to the hernia repair, one patient had a hysterectomy and in three, lipectomy was done for large abdominal panniculi.

There were fourteen patients in whom the postoperative temperature never rose above 100.4°F. In all patients but two,

adjacent fascia cleanly exposed. The first suture, to take up the slack or fullness in the sac is shown.

Fig. 3. A view of the outside of the hernial sac with the first inverting suture in position.

Fig. 4. To represent the appearance after the first suture has been drawn tight.

Fig. 5. A cross section to show the infolding produced by the first suture and the placement of suture No. 2.

Fig. 6. Suture No. 2 has been tied and the muscle edges brought together. Suture No. 3 is shown in place.

Fig. 7. Suture No. 3 has been tied and the surfaces of the fascia over a wide area have been brought in firm contact. This last suture rolls inward, the edges of the muscles forming the hernial orifice. A figure-of-eight retention suture is shown in position, tied over rolls of gauze, and the skin edges coaptated by a last stitch.*

* Illustrations from Figures 1 to 7 have been taken from Hayne's article, *New York State J. Med.*, 13: 630–637, 1913.

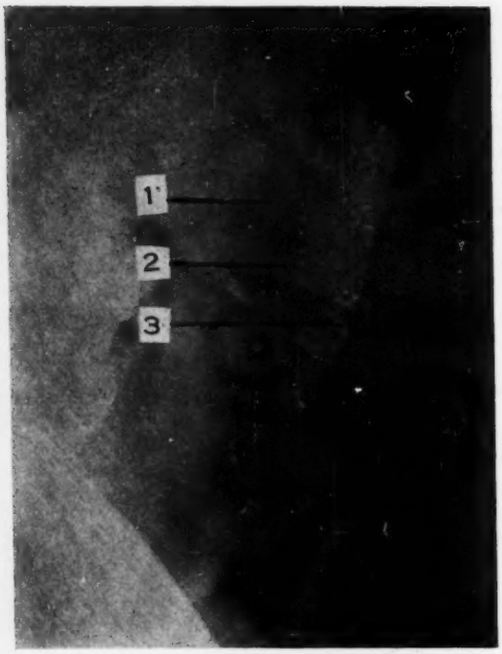


Fig. 8. *X*-ray taken six months after operation. Note the three layers of steel wire sutures and regularity of fascial edge.

the postoperative temperature was never above 100.4°F. after the third postoperative day. One patient had abdominal distention and a subcutaneous wound infection due to an intestinal injury while separating intraperitoneal adhesions and one patient a mild pulmonary atelectasis. There were two mild wound infections occurring shortly after operation and one large abdominal wall abscess as mentioned in Case I.

The lack of any severe postoperative complications or marked morbidity has been an outstanding feature in the convalescence of these subjects. That these patients have not been ideal operative risks is indicated by the fact that sixteen of the patients weighed over 180 pounds, three patients being diabetics and five hypertensives.

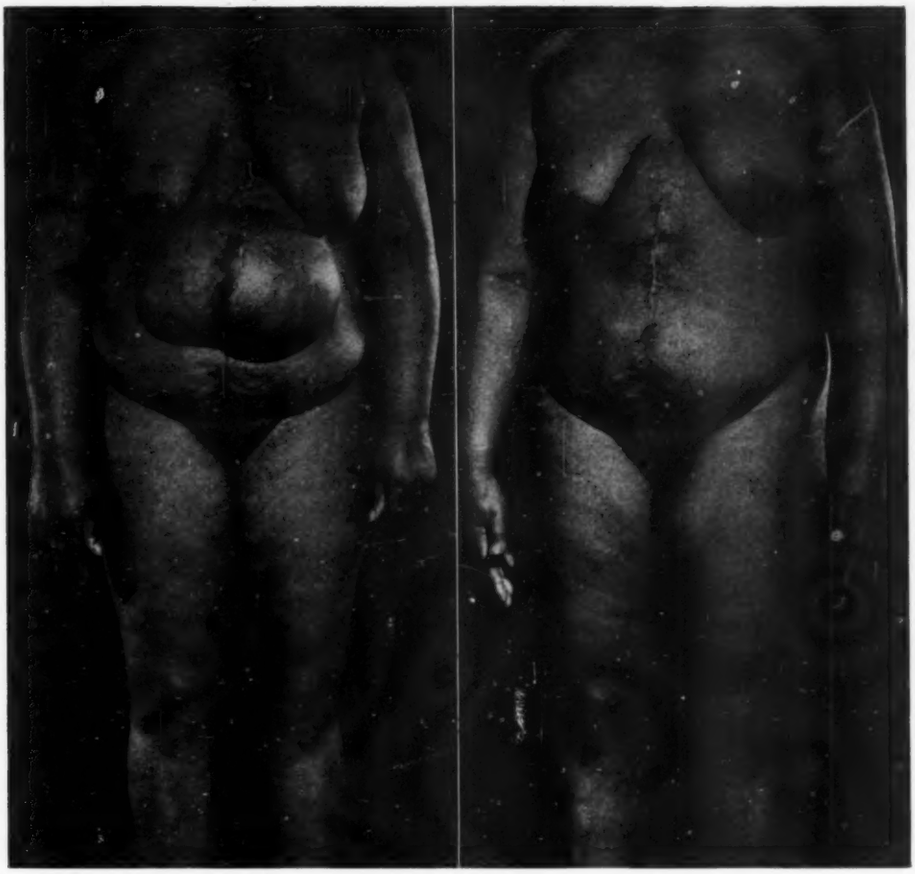
All of these hernias were fairly large varying from approximately 3 to 10 inches in diameter, the average being between 5 and 7 inches. The youngest patient was eighteen years of age and the oldest sixty-five.

In 1934, catgut and Kangaroo tendon were used as suture material and in 1937 silver wire was utilized. Since that time, stainless steel alloy wire (30 gauge) has been used with the exception of one case. Here the surgeon preferred catgut, having had no experience with wire. We believe that wire has definite advantages since it is non-absorbable and causes minimal tissue reaction.

That this type of repair with wire is of definite value is proven by some of the cases. In Case I the patient developed a massive postoperative wound infection and went to term of pregnancy two years later, without any recurrence of the hernia repair. After her second cesarean section she had a postoperative asthmatic bronchitis which resulted in a hernia through her recent incision but did not disturb the original repair. In Case II, the patient was operated upon not knowing that she was approximately four months pregnant. She went to term and delivered spontaneously four and one-half months after operation. She was again delivered vaginally at term four years later without any evidence of recurrence of the hernia. Case III had four repairs by other technics without wire. Follow-up one and one-half years after repairs with the inversion technic using wire, found her with no recurrence.

The hernia which recurred after utilizing the inversion method was Case VI. The recurrence was in the lower-third of the midline scar while the upper two-thirds remained solid. We believe that this was due to the hernia extending down over the symphysis pubis for a distance of 4 cm.; therefore, it was not suitable for infolding.

The advantage of this method of repair manifests itself in the ease with which the procedure is carried out, the utilization of all the thinned fascia in the sac to build up a stronger wall, the lack of great tension on the suture lines and that should perchance the repair break down there is no disruption of the abdominal wall but merely a recurrence of the hernia. With these large hernias, some with multilocular sacs and with underlying adherent viscera, there is



A B

Fig. 9. Case v. A, before operation; B, two months after operation.

considerable saving of time in not having to dissect all the abdominal layers. Also the method of suture is quite simple and time saving. It must be emphasized that the hernia must be reducible and there should be no symptoms of obstruction, partial or complete, if it is to be inverted without opening the sac.

The disadvantage that suggests itself immediately is the danger of perforating the intestine when the sac is not opened and the inverting sutures are introduced. This has not occurred in any of the patients nor in the seven cases reported by Haynes. The only intestinal injury occurred in one case in which the peritoneum was deliberately opened and intestinal adhesions separated. Another theoretical danger to be considered is the increased intra-abdominal pressure created by inverting the large sac and the abdominal walls themselves; however, this has caused no disturbance at all in any of the patients. Intestinal obstruction and possible strangulation of the intestines could be considered another danger theoretically but practically this has never occurred. It has been axiomatic that where there are any symptoms of partial or periodic partial intestinal obstruction the sac is to be opened and adhesions separated. When there have been no intestinal symptoms the sac has not been opened and none of these patients have developed intestinal obstructive symptoms partial or complete. This repair offers the simplest solution for cases in which the coils of intestine are so firmly adherent that separation would be difficult and in which the adhesions have not produced any tendency towards intestinal obstruction.

Haynes reported on seven patients without recurrence in a period of two years and

advocated this technic for the very large hernias that seem to be almost beyond any of the accepted methods of treatment. We have broadened his concept to include smaller hernias because of the ease of repair as well as excellent results.

CONCLUSIONS

1. A simple inversion technic for ventral incisional hernial repair is presented. The technic may be utilized in large and small hernias.

2. Thirty-one cases are presented with one recurrence, no mortality and a very low incidence of morbidity.

3. The recurrence occurred when the hernial sac extended over the symphysis pubis.

4. Stainless steel alloy wire is of value in hernial repair.

I wish to thank Dr. B. Z. Cashman for his help and counsel in the preparation of this material. I also wish to thank the other members of the staff for permission to include their cases in this report.

REFERENCE

Haynes, Irving S. *New York State J. Med.*, 13: 630–637, 1913.

It should be noted that the so-called umbilical hernia of adult life does not occur through the umbilicus. It is a protrusion through the linea alba just above the umbilicus or, occasionally, just below that structure.

From "A Short Practice of Surgery" by Hamilton Bailey and R. J. McNeill Love (H. K. Lewis & Co., Ltd.)

PREVENTION OF REPEATED MISCARRIAGE

LAWRENCE KURZROK, M.D. AND CHARLES BIRNBERG, M.D.
NEW YORK, NEW YORK BROOKLYN, NEW YORK

THE problem of repeated miscarriage has been troublesome and difficult for the obstetrician. Considerable prominence has been attained in recent literature by new advances in therapy to prevent repeated miscarriages. We wish to go one step further in treatment of this condition.

It is a well known fact that there are a great many miscarriages and we are prone to blame them in many instances on defective fetuses without realizing that there is probably a very good cause for the abnormality in the fetus. We incline to the theory of Mall[1] that many miscarriages are due to faulty implantation and believe that the invasiveness of the trophoblastic layer is dependent upon the amount of stimulation that it receives from the anterior pituitary and the placenta—in other words the depth and strength of attachment of the placenta depends upon the amount of prolan produced, either by the anterior pituitary or by the placenta. Many times we have performed Aschheim-Zondek tests on patients presumably pregnant in whom a vaginal examination failed to establish such a diagnosis. They were approximately six weeks from the last menstrual period and we found only a moderate follicular stimulation or even a negative response, only to find two weeks later on repeating the test a full positive test for pregnancy. This absence of a positive pregnancy test at a time when we normally would expect a full positive response is undoubtedly due to lack of prolan production, and we believe it most likely to occur in those women who have a considerable genital hypoplasia and in whom the uterus barely reaches a normal size at six weeks' gestation. It is not unusual to find in this group of hypoplasias some defect in the production of a good progestational phase premenstrually, although a poor luteal phase is not ruled out by the absence of genital hypoplasia. It is generally agreed that the production of prolan is highest in the first trimester of pregnancy with a gradual decrease thereafter. There is some evidence to show that the production of estrogen and progesterone lies in the syncytial cells.[2] We also know that a large percentage of miscarriages occur during the so-called "danger period" around three to three and one-half months of pregnancy, at a time when the corpus luteum of pregnancy is degenerating and the placenta takes over its function. It is very reasonable then to believe that insecure implantation of the placenta would result in insufficient production of the hormones necessary to the life of the pregnancy and bleeding at the site of the poorest syncytial penetration, i.e., separation of the placenta. Reduction in corpus luteum excretion and estrogen production frequently precede death of the fetus and miscarriage.[3-6] We are often unable to recover a fetus even though we have had the opportunity to follow the patient from the beginning of bleeding and we believe the same phenomenon takes place as in the rabbit, namely, resorption of the fetus.

It is our belief that Rh incompatibility does not produce miscarriage.

We have not had sufficient experience with vitamin E, except in threatened abortion. In such patients we were unable to obtain a salvage rate of any considerable proportions. In this series of cases no vitamin E was given any patient.

We have on occasion given very large doses of estrogens to patients during early pregnancy. We have in no patient interrupted pregnancy even with doses of 200,000 R.U. of progynon B given in a

period of seven to ten days. We did, however, have one patient who had cramps after the administration of 30,000 R.U., at five months' gestation and therefore discontinued the medication.

Vaux and Rakoff[7] reported good results in treatment of repeated miscarriage with estrogen-progesterone therapy. We also had good results with such treatment for the most part but had a number of failures, including some in patients whom we subsequently have carried through successfully on the medication indicated in this paper. They state that only when death of the fetus has been suspected do the chorionic gonadotropins begin to drop and do so quite precipitously. When the serum gonadotropins fell to 100 M.U. the fetus was usually non-viable. Yet it is difficult to tell whether the death of the fetus definitely preceded the drop in gonadotropins. In addition, no specific mention of frequent repeated readings is made. We also know that in some patients with genital hypoplasia, the estrogen excretion is normal. We had two failures in one patient on estrogen-progesterone therapy when we did not take the general physical make-up of the patient into account: tall woman, heavy bones, masculine pelvis, rather stout, with girdle obesity and other evidences of hypopituitarism.

Rutherford[8] has brought out an excellent point with which we are in complete accord, namely, that a patient who has miscarried is entitled to a thorough work-up to find wherein she fails, wherein her genital system is unable to carry the load of pregnancy, or even function normally during the non-pregnant state. Unfortunately too many good obstetricians and gynecologists do not check their patients carefully after a miscarriage. Every woman who has miscarried twice, or in whom there is evidence of some endocrine disturbance should have the following tests performed at a time when she is not pregnant: (1) Basal metabolic rate, (2) sugar tolerance—three-hour test, (3) endometrial biopsy—premenstrual, (4) examination of husband's semen, and (5) general physical examination and vaginal examination to determine the existence of genital hypoplasia.

Ingram[9] has reported his results with pregneninolone and vitamin E which were favorable in a moderate proportion of cases. Our experience with pregneninolone was less fortunate, as we had a few miscarriages, using doses of 20 to 30 mg. daily. We did not combine the pregneninolone with vitamin E, however. We do not believe that pregneninolone is an actual substitute for corpus luteum hormone in the form of progesterone by injection. Incidentally, we have one patient who has been taking 20 mg. of pregneninolone daily in the second half of the cycle for the past four or five months, who noted increased growth of hair on her arms. This was corroborated; the hair excess is not considerable and is light in color, similar to normal. We have discontinued the medication, temporarily. Has any other such occurrence been noticed? Of course, pregneninolone has possibilities of triple action: estrogenic, corpus luteum and male sex hormone. We do not know which action will result in the body.

Smith, Smith, and Hurwitz[10] have reported increased excretion of pregnanediol in pregnancy from administration of diethylstilbestrol. It is our belief that the natural estrogens act in the same manner. We have used ethinyl estradiol in a few cases, in place of alpha-estradiol, with satisfactory results. The dosage in those cases was 0.05 mg. of ethinyl estradiol three times daily. There were no cases of nausea or other untoward effects.

R. Kurzrok[11] has reported very excellent results in the treatment of repeated miscarriage with estrogen by mouth, and a combination of corpus luteum, prolactin and chorionic gonadotropin by injection. Our results are comparable in percentage of salvage, and we have followed through on similar therapy, with the exception of the prolactin which was not used in our series. Our dosage of corpus luteum was

higher than the average amount he gave, though we are working on a group of cases now, using smaller amounts of corpus luteum hormone, namely, 2 mg. per injection.

We are reporting herein a series of twenty-seven cases of repeated miscarriage treated by the administration of anterior pituitary-like hormone (APL), corpus luteum hormone (CLH) and estrogen. These women had miscarried from one to three times previously.

Treatment in our cases was begun as soon as a diagnosis of pregnancy was established or suspected, and consisted in the following:

Anterior pituitary-like hormone, 1,000 to 2,000 units three times a week until four and half months' gestation, then 1,000 units two times a week till eight months.

Corpus luteum hormone 5 mg. three times a week until four and a half months' gestation, then twice a week until eight months.

Estrogen—alpha-estradiol ½ to 1 mg. daily, depending upon the extent of uterine and genital hypoplasia present. In a few cases, ethinyl estradiol 0.05 mg. three times a day was given instead of alpha-estradiol with no apparent difference in effect.

Results. We were extremely fortunate in our results. There were no interruptions of pregnancy in our twenty-seven cases. Miscarriage did not take place, though there were cases which bled even during treatment. We do not believe the treatment outlined is a panacea for all miscarriages, nor does it preclude further improvements and changes as our conceptions, knowledge and armamentarium improve and grow. The babies delivered were normal, with the exception of one, which was a Mongol; in this case, active movements had been heard at three and a half months, and the fetal heart at four and a half months' gestation. This patient went into labor ten days before term, had a spontaneous easy delivery, the weight of the baby being 5 pounds 10 ounces.

Case histories and pertinent findings follow:

S. M., para two, gravida three, age forty years, had a normal first pregnancy. She had a spontaneous miscarriage at three and a half months with the second pregnancy. She was delivered at term with this pregnancy by low forceps of a 7 pound 3 ounce male infant.

A. R., para two, gravida five, had a normal first pregnancy, followed by three miscarriages at three and three and a half months. Periods occurred every three and a half to five and a half weeks, with a three-day flow. It took several years for the patient to conceive this time. Medical induction was attempted several times up to two weeks past term, and then a cesarean section performed. The baby was a normal 8½ pound boy. The patient looks like a hypothyroid and hypopituitary. The basal metabolism during pregnancy was plus six, plus thirteen. The admitted age was forty-one, but the woman looked much older.

P. S., age twenty-nine, para one, gravida two, had one miscarriage at nine weeks. Her periods occurred every three to six weeks for six days, with occasional flow of four to five days. On first examination at ten weeks' gestation, the uterus was seven to eight weeks in size, with the cervix small and fairly firm. The breasts showed raised areolae, with moderate development of the nipples and a normal amount of gland tissue. The uterus was consistently two weeks behind in size throughout the pregnancy. Delivery was by low forceps as a direct persistent occiput posterior. The baby was a normal female, weight 6 pounds 3 ounces. On examination six weeks postpartum, the uterus was small and normal in size.

A. S., para one, gravida one, had a normal menstrual history. The patient was first seen at six and a half weeks' gestation, at which time the uterus was anterior, two-thirds normal size and firm in consistency; the cervix was infantile and longer than the uterus. There was a soft spot just at the junction of uterus and cervix. The Ascheim-Zondek test was negative but was positive at eight and a half weeks, at which time the uterus was normal in size, with a positive Hegar sign. This patient was treated till eight months' gestation, and was delivered three weeks after cessation of therapy, of a boy weighing 4 pounds 9 ounces, breech presentation. Check-up examination three months after

delivery revealed a uterus about three-fourths normal size. We believe that this type of patient will repeatedly miscarry, and believe that her medication should have been continued till full term.

T. W., age forty, para two, gravida six, had three miscarriages with the first three pregnancies, at two and a half to three months. The fourth pregnancy was carried to term with therapy, and a cesarean section performed because of fetal distress; there was considerable atelactasis at birth, requiring oxygen tent for over a week with complete recovery. The fifth pregnancy ended in miscarriage at three months, but no medication had been given during the gestation. The sixth pregnancy was carried to full term, and a normal child delivered by cesarean section. This baby also suffered from atelectasis, requiring oxygen therapy for a week. Treatment was continuous throughout the entire pregnancy. The patient herself presents outward appearances of a hypopituitary; when hormone therapy was not administered during pregnancy, the patient miscarried each time.

F. W., age thirty-two, para two, gravida three, had originally been seen for sterility. The uterus was small, normal in size, and biopsy showed full secretory phase. Under treatment for a short time, the patient conceived, and was put on pregneninolone 20 mg. daily. She miscarried at about three months, and was seen by one of us at and from the time of rupture of the membranes; no fetus was found. Menstrual periods had begun at eleven years, every thirty days, with a three-day scant flow. This patient has been carried to term twice since, each time on therapy, and delivered by low forceps of living normal children, male and female, weighing between 6 and 7 pounds. The uterus on most recent examination is about three-fourth normal size, the right ovary about twice normal size and believed to be the site of a dermoid.

M. W., age thirty-two, para one, gravida three, had a miscarriage at ten weeks, with the first pregnancy, at which time an intact sac with a five weeks' fetus was obtained. An ovarian cyst 10 by 4 cm. was palpated, and allowed to remain, with gradual recession in size. The second pregnancy terminated in miscarriage at ten weeks, when an intact sac was found with no fetus; the placenta was thin and very poor in appearance. The uterus has always been about three-fourths normal size during the non-pregnant state. The third pregnancy was carried to term with therapy and a normal female infant weighing 5 pounds 10 ounces delivered by low forceps.

T. L., age twenty-seven, para two, gravida five, began to menstruate at thirteen years of age, irregular periods occurring every three to four months, scant in amount. The uterus was infantile, the size of the terminal phalanx of the index finger. Periods were regulated about once a month with estrogen therapy. There was no difficulty in conception, the first two gestations ending in miscarriages at four months and six weeks, respectively. The third pregnancy was carried to term with treatment during the first seven months. The fourth pregnancy terminated in miscarriage at four months during which time no medication was given. The fifth pregnancy was carried to term without treatment; however, the patient bled and stained almost continuously for the first six months. Deliveries were by low forceps, the babies being girls, weighing 6 pounds 8 ounces and 7 pounds 1 ounce, respectively. We believe this patient was very fortunate to carry through the last pregnancy; certainly she was a threatened abortion throughout the first six months. It is conceivable that had any more placenta separated, she would have been unable to carry through to term.

J. G., age thirty-four, para one, gravida two, was seen for sterility, after the first pregnancy, which ended in miscarriage at two months. She presented no evidences of abnormality and conceived with little difficulty soon after. She was carried to term without difficulty on therapy and delivered by low forceps of a baby weighing 7 pounds, 6 ounces.

H. E., age thirty-eight, para two, gravida five, had a normal first pregnancy with a normal child. The two following pregnancies ended in miscarriage at three months, and a premature birth at seven months which did not survive, respectively. A work-up revealed a uterus slightly smaller than normal; basal metabolism of minus eleven and thirteen, and a good progestational premenstrual endometrium. With the fifth pregnancy, she was carried on therapy till eight and a half months, and delivered spontaneously almost two weeks before term. The baby weighed 5 pounds 10 ounces, and was a Mongol with thyroglossal and branchial duct remains. Fetal movements

in this case were very definitely audible at three and a half months, and the fetal heart at four and a half months. This is the only abnormal child delivered in our series. The uterus was consistently small throughout pregnancy. The Rh factor was positive in both husband and wife.

F. H., para one, gravida two, age thirty-one, had a miscarriage at two and a half months with the first pregnancy, at which time an intact sac was found but no fetus. The second pregnancy was carried to term. The patient was delivered by low forceps, of a female infant weighing 6 pounds 12 ounces; therapy was given only till the patient was four and a half months' pregnant.

A. L., age twenty-eight, para one, gravida four, had a familial history of diabetes, a brother and two aunts having the disease. However, the patient herself showed no evidence of diabetes. The first three pregnancies terminated in miscarriages at eight to nine weeks. The uterus was a small normal size, and one fibroid the size of a hazelnut was palpable. With the fourth pregnancy, therapy was instituted and the pregnancy carried to term. The patient was delivered by low forceps of a normal male infant weighing 7 pounds 12 ounces. The menstrual history of this woman indicated onset at fourteen years of age, occurrence of periods every five to six weeks, with a three-day light flow.

B. S., age twenty-eight, para one, gravida four, had three miscarriages at two and a half to three and a half months. With the fourth pregnancy, the patient had vaginal bleeding early in gestation, in addition to a complication of phlebitis of both legs with fever. She was carried to term under therapy and a cesarean section performed because of a breech presentation, ruptured membranes and a long slow poor labor. The child was normal.

B. S., age twenty-four, para one, gravida two, had a miscarriage at two months with the first pregnancy. She was placed on therapy during the second gestation, when she began to stain and had a brownish discharge at six weeks. The patient was carried to term and delivered by low forceps of a normal male child weighing 7 pounds 9 ounces.

F. S., age twenty-six, para one, gravida three, had two miscarriages between two and three months. Her general appearance was that of a hypopituitary, heavy bones and a long face. The third pregnancy was carried to term on therapy and the patient was delivered by low forceps of a normal child.

S. W., age thirty-two, para one, gravida three, had two miscarriages at two and a half to three months. She was treated for irregular periods with APL and estrogens with good results. During her third pregnancy she was started on sheep pituitary but proved allergic to it, and the routine as given in this paper was begun. She was delivered at term of a normal male child weighing 7 pounds 14 ounces. This patient is a typical hypopituitary with heavy android pelvis, moderate obesity, thick bones and a long face. Periods have continued regular since pregnancy, but the uterus is somewhat smaller than normal, especially considering the number of pregnancies.

A. E., para one, gravida two, had irregular periods, usually every eight to ten weeks, and occasionally skipped eight to nine months. The first pregnancy ended in miscarriage at four and a half months. With the second pregnancy the patient was put on therapy and delivered of a normal full term male infant weighing 8 pounds 3 ounces. The uterus on postpartum examination was about three-fourths normal size. The pelvis was android.

E. B., age twenty-two, para one, gravida three, suffered a miscarriage at seven weeks with her first pregnancy. The second pregnancy went two weeks postmature with delivery of an 8 pound 9 ounce baby; therapy had been given. During the third pregnancy she began to bleed early and bled for over a month though therapy had been instituted. She was delivered four weeks postmature of a normal baby weighing over 8 pounds. Therapy had been continued till seven months.

M. A., age twenty-eight, para one, gravida two, had periods every twenty-six days, lasting five to six days. The first pregnancy ended in complete miscarriage at three months. Therapy was not instituted with the second pregnancy until bleeding had already begun and then was continued throughout the pregnancy. Bleeding continued during the first three months. We believe that a larger dosage of APL should have been given, the amount at that time per injection being 500 units. The patient was delivered by low forceps at term of a normal baby boy weighing 9 pounds 1 ounce. Her blood pressure rose to 145/100 during the last month of pregnancy.

F. S., age twenty-two, para one, gravida one, came to us for sterility, and the following results were obtained on series of tests: Basal metabolism minus ten, sugar tolerance 70-86-74-70, on three-hour tests. Her periods began at twelve years of age, every thirty-three days, with a four-day flow. Endometrial biopsy was performed at the time of an expected period and showed an early secretory phase; however, the patient skipped this period, and was proven pregnant two weeks later. The uterus on original examination was about two-thirds normal size and became normal in size at six weeks' gestation. Therapy was continued till eight and a half months. The patient was delivered at term by low forceps of a living normal baby weighing about 6½ pounds.

E. C., age thirty-four, para one, gravida three, had periods every twenty-eight days, lasting five to six days. The patient was treated by us for ovulation bleeding of five years' duration, during which time she bled three weeks out of each cycle. With treatment this condition was corrected. The first pregnancy ended at four months in spontaneous miscarriage with the fetus present. During the next pregnancy the patient was given corpus luteum by injection and estrogen by tablet, and miscarried at three and a half months, the fetus being present on this occasion also. With the third pregnancy, the patient was placed on our present therapy, and despite early bleeding and brownish discharge during the second month lasting about three to four weeks, she was carried to term and delivered of a normal female child weighing 7 pounds 2 ounces. She is again pregnant and is receiving medication, thus far with good results.

E. D., age twenty-seven, para two, gravida two; this patient was treated by us for amenorrhea of two years' duration. Previously her periods occurred about twice a year, and at best the intervals were one to six months apart. With treatment the periods were regulated monthly and the patient became pregnant. Therapy was instituted and the pregnancy carried to term with delivery of a normal child, a girl, weighing 7 pounds 12 ounces. The patient's periods have continued normal since, and a second pregnancy completed to term without therapy, a normal child resulting.

R. F., age twenty-seven, para one, gravida three, had two miscarriages at three and two and a half months with the first two pregnancies. The patient has a markedly contracted android pelvis, and the uterus was two-thirds its normal size. Endometrial biopsy revealed a good secretory endometrium, and the basal metabolic rate was normal. The patient became pregnant and was carried to term on routine medication. She was delivered by cesarean section of a normal male infant weighing 6 pounds 5 ounces. The Aschheim test was positive at six weeks' gestation. The patient bled at seven and a half weeks' gestation for almost a week, and the pregnancy rat test was negative at two months. At this time pelvic examination showed the uterus to be soft, about six weeks' gestation in size, and the patient was considered still pregnant. Repetition of the pregnancy test at two and a half months gave a positive response. We believe this patient should have been given much larger doses of APL in the early weeks of pregnancy, as high as 2,000 units, instead of the 1,000 twice a week which had been given prior to the threatened abortion.

R. E., age twenty-seven, para one, gravida five, had three miscarriages at six weeks and one at eleven weeks. The patient suffered with migraine severely. She was carried throughout the fifth pregnancy under therapy and delivered by low forceps of a normal male infant weighing about 7 pounds.

M. C., age twenty-three, para three, gravida three, had a stillbirth at seven months with the first pregnancy. Bleeding had occurred practically throughout the pregnancy. The second pregnancy produced a seven months' live infant weighing 2 pounds 4 ounces which survived. With the third pregnancy the patient was carried to term with therapy till eight and a half months. Delivery was effected of a normal infant weighing 4 pounds 10 ounces.

E. G., age thirty-two, presented a hirsute appearance, with hip obesity and suffered from considerable dysmenorrhea. Her periods began at fourteen years of age, every twenty-eight to thirty-one days, with a three- to four-day flow, scant in amount. The uterus was more or less bicornuate with dimpling at the fundus, one half normal in size with a hypoplastic cervix. On becoming pregnant she was carried to term on therapy and delivered of a normal female infant.

M. L., age twenty-three, para four, gravida five, had normal pregnancies with the first three gestations. Miscarriage with the fourth pregnancy occurred at five months. During the

fifth pregnancy, bleeding occurred throughout the fourth, fifth and sixth months with occasional spotting after the seventh month. Therapy was begun at four months and continued till eight and a half months. The patient was delivered at term, of a normal female infant weighing 5 pounds 8 ounces. We believe it likely that miscarriage would have taken place had therapy not been given, especially in view of the previous difficulty.

CONCLUSIONS

1. The treatment and prevention of repeated miscarriage is still in the experimental stage.

2. Any patient who has had two miscarriages, and/or who shows clear evidence of endocrine genital dysfunction or hypoplasia with occurrence of even one miscarriage, should be investigated as to glandular and genital capabilities.

3. Twenty-seven patients who had miscarried from one to three times were treated with combined therapy, consisting of APL, CLH and estrogens. Twenty-seven babies were delivered, all of which were normal, except one, which was a Mongol.

4. There were no postpartum hemorrhages, nor were there any unusual complications during labor or puerperium. Type of delivery was unaffected. Cesarean section was performed in four cases.

5. Labor did not set in earlier than ten days after discontinuance of the injections. In most cases, there was a lapse of approximately three weeks. In several other cases in which CLH had been given without APL, bleeding occurred about three weeks after stopping of the therapy, at four, four and a half, and six months, respectively.

6. We are inclined to give our more recent patients larger doses of APL in the early months, namely 2,000 units three times a week, and trust that this will tend to prevent the bleeding which sometimes occurred in the first trimester.

7. Therapy for repeated miscarriage should be prophylactic. Treatment begun after miscarriage has already threatened is in many instances hopeless, as the fetus is often beyond help or entirely resorbed; however, such treatment should be instituted until a definite diagnosis can be made as some cases will be carried through successfully.

8. Many patients other than those presented in this paper, who presented evidence of endocrine dysfunction, and whom we considered quite likely to miscarry, have been treated by us prophylactically during pregnancy, with excellent results, using the therapy as outlined.

REFERENCES

1. Mall, F. P. *J. Morpbol.*, 19: 1, 1908.
2. Wislocki, G. B. Proceedings of Conference on Problems of Human Fertility. P. 134. Wisconsin, 1943. G. Banta Pub. Co.
3. Hamblen, E. C. Endocrinology of Woman. P. 476. Springfield, Ill., 1945. Chas. C. Thomas.
4. Hamblen, E. C., Cuyler, W. K. and Baptist, M. *Am. J. Obst. & Gynec.*, 44: 442, 1942.
5. Browne, J. S. L., Henry, J. S. and Venning, E. H. *Am. J. Obst. & Gynec.*, 38: 927, 1939.
6. Hain, A. M. *J. Endocrinol.*, 3: 10, 1942.
7. Vaux, N. W. and Rakoff, A. E. *Am. J. Obst. & Gynec.*, 50: 353, 1945.
8. Rutherford, R. N. *Am. J. Obst. & Gynec.*, 51: 652, 1946.
9. Ingram, C. H. *Am. J. Obst. & Gynec.*, 50: 154, 1945.
10. Smith, O. W., Smith, V. S. and Hurwitz, D. *Am. J. Obst. & Gynec.*, 51: 411, 1946.
11. Kurzrok, R. *New York State J. Med.*, 46: 493–497, 1946.

ART IN THE NASAL PLASTIC OPERATION

FROM THE POINT OF VIEW OF THE RHINOLOGIST

LOUIS M. PEARLMAN, M.D.*
Diplomate of the American Board of Otolaryngology
NEW YORK, NEW YORK

AS the central feature, the nose affects the appearance of all the features of the face. The shape of the nose may correlate the features, producing an harmonious appearance and a pleasing expression, or, on the contrary, it may produce exactly the opposite effect. Indeed, the appearance of each and every feature of the face is influenced by its relation to the size and shape of the nose.

Standard artistic concepts of form, proportion and harmony apply to the effect of the shape and size of the nose on the rest of the features, facial contours and expression. A long face is exaggerated by a long nose; the face appears rounder when the nose is shortened. A moderately protruding chin is accentuated by a long nose, but it becomes inconspicuous and may even be attractive if the nose tilts in the same direction as the chin. A receding chin is accentuated by a retroussé nose. Deep-set eyes look sunken when the bridge of the nose is too high; prominent eyeballs appear to protrude if the bridge of the nose is too low. A high forehead is exaggerated if it is continuous with the nose without a depression below the glabella; whereas a low forehead is less conspicuous if it is continuous with the nose through a high nasal root. A receding forehead is accentuated if the bridge of the nose is high. A high nasal bridge exaggerates broad cheeks; while, on the other hand, it tends to soften the effect of narrow cheeks. A flat or a saddle nose gives a coarse appearance to the face. If the upper lip is too short, proper balance is established by adequate shortening of the nose. By producing harmony of features the objectionable "plastic look" is avoided.

A number of these factors affecting facial harmony and expression are illustrated in the following cases. Practical suggestions in surgical technic are made under each topic.

A long face is exaggerated by a long nose; the face appears rounder when the nose is shortened. (Figs. 1 and 2.)

Shortening of the nose is done on three planes: the midline (septum and columella) and the two alae. The midline should be slightly longer than the lateral planes, or the result will be either a hanging septum or a retracted columella. A hanging septum would require further shortening of the septum, while a retracted columella can be corrected by insertion of a cartilage graft between septum and columella.

In shortening the lateral cartilages, care should be taken that both alae are even, otherwise one nostril will be higher than the other. This result may be avoided by leaving the excess of lateral cartilage until the end of the operation and until the sutures are in place. The excess of upper lateral cartilage will thus be apparent and the exact amount can be removed from each side.

In the operation of Case I, a partial submucous resection of the nasal septum was performed to correct an existing defect in nasal function. The cartilage removed served as a homogenous cartilage graft for the correction of a saddle nose in another case.

In Case II, a left inferior turbinotomy was done at the end of the operation to retain proper function. Indeed, some form of intranasal surgical procedure for the maintenance of free passage of air is necessary in over 50 per cent of nasal plastic

* Lecturer, Otorhinolaryngology, New York Polyclinic Medical School and Hospital.

Fig. 1. Case 1. Long nose, short upper lip; A and C, preoperative views; B and D, postoperative illustrations.

operations. The position of the vestibule of the nose is altered when the nose is shortened and adjustment must be made for its new position. A thick or even a slightly deflected septum, a septal spur, a moderately hypertrophied anterior tip of the inferior turbinate will impinge on the vestibule and interfere with the passage of air after the nose is shortened and narrowed. The nasal plastic operation will of itself not correct nasal obstruction; on the contrary, it may produce it. Measures for prevention or correction of nasal obstruction must be planned and carried out in each operation. The form and the function of the nose are anatomically interdependent.

If the upper lip is too short, proper balance is established by adequate shortening of the nose. (Figs. 3, 4 and 5.)

The effect of a short upper lip is disharmony of features in the lower part of the face. A long septum and nasal spine impinges on the upper lip at the philtrum. The amount of these structures that are removed determines the increase in the size of the upper lip.

Figures 3, 4 and 5 show cases with short upper lips and many other defects. Some of these defects developed as a consequence of fractures which occurred in childhood. The nose is broken more frequently than any other part of the body. Such injuries can very often be traced to early childhood when the child, in first learning to walk, falls frequently. There

FIG. 2. Case II. Long nose, bulbous tip; A and C, preoperatively; B and D, postoperatively.

may have been what was considered a slight injury with little bleeding, yet a fracture of the nose was overlooked. With growth, deformities develop and the function of the nose is increasingly impaired. Such deformities could be prevented by treating fractures of the nasal bones and septum in the same way as fractures of any other part of the body—by replacement and retention of the broken fragments shortly after the injury and before union takes place. Even a marked displacement of the bone can often be pushed into normal position where it may remain even without splints. But if nothing is done at the time, a complicated operation may later be necessary to achieve the desired result.

In the light of my experience, *x*-ray is less reliable for the diagnosis of fracture of the nose than is palpation. In the anteroposterior position, the nasal bones are superimposed on the bones of the skull and face, and many fractures will escape detection in the plate. Careful palpation, however, will readily elicit crepitus and detect displacement. It is safe to assume that whenever the nose has received a severe blow it is a broken nose until proven otherwise.

The variety of malformations that may result or develop from a broken nose is quite considerable. Thus the plastic operation required may be complicated and must be carefully planned. It is usually possible to correct both the inner and outer defects in one operation. The septal cartilage removed can be utilized to correct a saddle deformity which may be present

Fig. 3. Case III. Fracture sustained in childhood; A and C, preoperatively; B and D, postoperatively.

or which may occur in the course of a difficult operation. Occasionally, however, it is necessary to perform two operations: first a nasal plastic, and a subsequent operation on the septum in order to obtain the best results in both form and function of the nose.

A moderately protruding chin is exaggerated by a long nose but becomes unobjectionable, and may even be attractive if the nose is tilted in the same direction. A slightly receding chin is improved when the distance between the chin and the nasal dorsum is reduced by a nasal plastic operation. (Figs. 6 and 7.)

Radical changes of appearance following certain plastic operations, such as may be seen in Figures 6 and 7, produce a psychological effect on the patient and his family which must be anticipated before the operation. The patient should be an emotionally stable and a psychologically adjustable type who is entirely dissatisfied with the present appearance of his nose. The patient's concept of the existing defects and of the results to be obtained by an operation, should agree with those of the surgeon. If patient and surgeon do not see eye to eye in this matter, the operation should not be undertaken. No matter how esthetically successful the results may be, the operation has failed in its purpose if the patient afterwards continues to complain, "I look so strange; I can't get used to myself." A happier paitent is the objective of the operation.

FIG. 4A.

FIG. 4B.

FIG. 5A.

FIG. 5B.

FIG. 4. Case IV. Fracture sustained in childhood; A, preoperative view; B, postoperative view.

FIG. 5. Case V. Curved dorsum, hanging septum; A, preoperatively; B, postoperatively.

A flat or a saddle nose gives a coarse appearance to the face; this is readily corrected by means of cartilage graft. (Fig. 8.)

A nasal plastic operation was performed in Case VIII to narrow the nose, and a submucous resection of the septum was done to correct nasal obstruction. The cartilage removed from the septum was cut into long strips and used for building up the depressed nose. The additional cartilage required had been removed from another case ten days previously. This cartilage was kept on ice in sterile saline solution. The patient was seen two and one-half years after the operation and no evidence of absorption of cartilage was apparent.

Fresh autogenous septal cartilage is undoubtedly the best material for correction of nasal depressions. Fresh homogenous septal cartilage is second choice. I have often collected septal cartilage from several cases, kept it in sterile saline solution on ice for two weeks, and then used it for the correction of the saddle nose. Culture of the solution was made before using the cartilage. Fresh rib cartilage taken from the patient adds to the extent of the operation and is not so satisfactory for this purpose as septal cartilage. Rib or septal cartilage preserved in antiseptic solution tends to be absorbed when placed in the dorsum of the nose. This tendency is greatly reduced when the cartilage is used in the amount necessary for building up a chin. Ivory, metals and plastic materials are not absorbed, but they remain

FIG. 6A.

FIG. 6B.

FIG. 7A.

FIG. 7B.

FIG. 6. Case VI. Moderately protruding chin, long nose; A, preoperatively; B, postoperatively.

FIG. 7. Case VII. Moderately receding chin, high nasal profile; A, preoperatively; B, postoperatively.

a foreign body, and there is a tendency for them to be extruded in time. I am now preserving fresh septal cartilage by quick freeze with carbon dioxide snow, keeping it frozen in the ice-chamber of the refrigerator. There is good reason to expect that this will prove a satisfactory solution to the problem of the preservation of fresh cartilage. A report on the results with this cartilage will be made in due time.

Deformities in both nose and chin call for correction of both defects. (Fig. 9.)

A receding chin is usually accompanied by a long nose. A nasal plastic operation does not alone establish harmony of features in these cases. The shortened nose increases the space between the chin and the tip of the nose, and accentuates the recession of the chin. A combined nasal and chin plastic is required in such cases. The material to be used for building up the chin is similar to that required for building up a saddle nose. The use of fresh septal cartilage is obviously not feasible since the amount required is considerable. The insertion of ivory is the simplest procedure but this remains a foreign body and tends to be extruded in time. Autogenous rib or hip graft is very desirable but it more than triples the extent of the operative procedure. Following the technic of Dr. L. A. Peer, I have used diced septal cartilage preserved in antiseptic solution (metaphen 4 per cent) in several cases. Because of

Fig. 8. Case VIII. Flat, broad nose; A and C, preoperative views; B and D, postoperative views.

the relatively large volume used for building up a chin, the amount of absorption seems to be slight. The procedure with this material is simple and easily carried out. There is reason to believe that the quickly frozen cartilage mentioned in connection with Case VIII will solve the problem of having a supply of fresh cartilage always available.

The nasal tip is the index of a nasal plastic operation. (Figs. 10 to 15.)

Obtaining a well formed tip often calls for the best in skill, judgment and experience on the part of the surgeon. The surgery of the nasal tip is largely the surgery of the two alar cartilages. These cartilages form the major part of the lower end of the nose and determine the shape of the tip and nostrils. Defects of the alar cartilages are many and varied and they are often a challenge to the ingenuity of the surgeon.

The surgery of the nasal tip is extensive and only a few "don'ts" too often overlooked will be mentioned. The midline incision on the columella for the insertion of cartilage graft in the dorsum of the nose is never necessary and should not be made. All dorsal grafts can be more easily inserted through an intranasal incision and an external scar is thus avoided. In removing a triangular section of alar cartilage for narrowing the nose, care should be taken not to make the nostril too small. Very small and pinched nostrils are unattractive and often ruin nasal function. If the columella is short, it is futile to attempt to hold it up by sutures from the septum pulling the colu-

Fig. 9. Case IX. Receding chin, high nasal profile; A and C, preoperatively; B and D, postoperatively.

mella upward. It may appear satisfactory on the operating table, but in a few weeks the movements of the upper lip in talking and laughing will pull the columella down to its former position. If the tip of the nose must be raised a little, a cartilage graft on the dorsum of the tip will help. In rare and extreme cases the columella must be lengthened by incisions in the upper lip.

Adhesions in the vestibule of the nose resulting from previous operations or trauma produce nasal obstruction and dimpling of the affected alae. Correction by skin grafting is difficult and uncertain. Such adhesions are easily corrected by incising the scar tissue and suturing a thin strip of rubber between the septum and the lateral wall, leaving the rubber in place for seven to ten days. Uneven alar cartilages are quite common. As a result, the tip of the nose may be longer, broader or higher on one side, and the nostrils uneven. The larger ala should be reduced by excisions to approximately the size of the smaller ala. It is usually difficult in such cases to make the alae and nostrils on both sides precisely alike. It should be emphasized that the slightest loss of tissue at the tip of the nose, especially at the rim of the nostrils, is a serious disfigurement difficult

FIG. 10A. FIG. 10B.

FIG. 11A. FIG. 11B.

FIG. 12A. FIG. 12B.

FIG. 10. Case X. Drooping nasal tip, hanging septum; A, preoperatively; B, postoperatively.

FIG. 11. Case XI. Flat, irregular tip, retracted columella; A, preoperatively; B, postoperatively.

FIG. 12. Case XII. Drooping nasal tip; A, preoperatively; B, postoperatively.

FIG. 13A.

FIG. 13B.

FIG. 14A.

FIG. 14B.

FIG. 15A.

FIG. 15B.

FIG. 13. Case XIII. Bulbous tip; A, preoperatively; B, postoperatively.
FIG. 14. Case XIV. Hanging nasal tip; A, preoperatively; B, postoperatively.
FIG. 15. Case XV. Uneven nasal tip; A, preoperatively; B, postoperatively.

FIG. 16. Case XVI. A and B, identical twins before operation; C, postoperative view of twin in A; D, postoperative view of twin in B.

to repair. This should be borne in mind when carrying out measures of asepsis, making incisions, applying any of the postoperative splints and when making use of compression for narrowing the nose.

In performing nasal plastic operations on identical twins (Fig. 16), care should be taken to maintain the identical appearance. To do this, it is best to perform the operations consecutively, while the memory of the technical details is fresh. In the above cases, one of the twins, B, had had her nose fractured in childhood. Her nose was longer and she had nasal obstruction from a deflected septum, which required a submucous resection. The predominant defect in this pair of twins was the excessive length of the nose.

In shortening a long nose, it is a good precaution to remove only half of the estimated excessive length of the septum first. The rest of the septum requiring removal should be shaved down with a knife gradually, thus guarding against making the nose too short. If the septum and nasal spine impinge on the upper lip, making it too short, they should be removed with biting forceps, using the same precaution of "a little at a time." After the sutures are in place, the length of the nose is carefully inspected. If it is slightly short or slightly long, the required correction should be made at once and thus avoid a subsequent secondary operation. If it is noted that the nose has been made a little too short, it may be immediately lengthened

Fig. 17A.

Fig. 17B.

Fig. 18A.

Fig. 18B.

Fig. 17. Case xvii. Nose overemphasized in photographs; A, preoperatively; B, postoperatively.
Fig. 18. Case xviii. Nose broken in childhood; A, preoperatively; B, postoperatively.

as follows: The septal mucous membrane is undermined on each side for about three-quarters of an inch and the mucous membrane pulled down to the desired length. The mucous membrane is then sutured to the columella on either side. Perforations between the septum and columella can be avoided by supplementing the through-and-through sutures with sutures of the mucous membrane and columella on each side.

Major effects in harmony of features can often be attained by minor changes in nasal structure. (Figs. 17 to 20.) For professional reasons, the movie actor, photographer's model, television performer, etc., often require an operation which would otherwise be unnecessary. These cases, especially, require caution and conservatism in obtaining the desired photogenic results with only slight structural changes. The nasal passages should be scrutinized for any obstruction that may interfere with the quality of the voice after operation. The end result should be clearly visualized and the alterations in the structures should be pre-determined to the minutest detail. If a very small bony hump is present, it should be removed with a fine rasp. The saw should not be used for this purpose, as it is likely to remove more than is required, producing the unattractive scooped "plastic-looking" nose. For the same reason, scissors or a Joseph

FIG. 19A. FIG. 19B.

FIG. 20A. FIG. 20B.

FIG. 19. Case XIX. Slight imperfections of nose; A, preoperatively; B, postoperatively.

FIG. 20. Case XX. Prominent nose; A, preoperatively; B, postoperatively.

septal punch should not be used for removing a triangular piece of the lower end of the septum in shortening the nose. Too much may be cut away. It is much safer to use a No. 15 Bard-Parker blade to shave away the lower end of the septum cautiously to the desired length. Instruments that have been devised for measuring the nose and features are of little help in determining the millimeter changes of the soft, flexible tissues of the features which change in form more or less with every slight expression of the face. Calculations based on the use of rigid measuring rods and routine rules can not substitute for the taste, judgment, caution and experience required in a delicate nasal plastic operation.

CLOSURE OF COLOSTOMIES AND FISTULAS OF THE LARGE BOWEL*

LIEUT. COL. CHARLES S. HERTZ† AND COL. D. HENRY POER†
MEDICAL CORPS, ARMY OF THE UNITED STATES

GUNSHOT wounds of the large bowel have been many and varied in World War II. The management of these cases in the combat areas was superb, as evidenced by the brilliant results in lives saved. The highest praise must be given to those surgeons who, under the most trying circumstances of battle conditions, fatigue, limited personnel and equipment performed so nobly.

The immediate surgical treatment consisted of repair of the damaged colon by suture or by exteriorization of the damaged segment or by an obstructive resection of the traumatized area. Suture was usually reserved for the lowermost portion of the colon where mobilization for exteriorization is impossible. In these cases a proximal colostomy was performed to divert the fecal stream.

In civilian life a colostomy is closed by the surgeon who created it and who therefore knows the true picture of it. In war surgery this opportunity is usually lost. Many of the soldiers with colostomies are returned to the United States for closure. The surgeon in the general hospital in the Zone of Interior is the one confronted with this task. He is aware of the arduous circumstances under which the colostomy was formed. The operative notes may be brief or absent. Therefore, he is presented with a real problem as to the best way in which to complete the surgical care of these soldiers.

Persistently draining fistulas not infrequently complicate these cases. They usually communicate with some portion of the intestinal tract. The purpose of this paper is to present our experiences in dealing with these two problems: (1) closure of colostomies and (2) closure of large bowel fistulas.

COLOSTOMIES

Thirty-two patients have had their colostomies closed at Newton D. Baker General Hospital. Table I indicates the location of these colostomies. Some of them were of the sigmoid, double-barreled type, usually created for the purpose of diverting the fecal stream from a repaired distal lesion. Some of them had been formed as an exteriorization of an injured portion of the colon. In six patients an obstructive resection of a portion of the colon had been performed. In four of these a double-barreled colostomy was formed. In the remaining two, the two limbs of bowel were brought out at different points on the abdominal wall. (Fig. 1.) The methods of closure used are shown in Table II. During 1944, most of the closures were done extraperitoneally. The intraperitoneal method was used for the most part during 1945.

TABLE I
COLOSTOMIES

Location	No.
Cecum or ascending colon	9
Transverse colon (including flexures)	6
Sigmoid colon	17
Total	32

Preoperative Care. It is our belief that the preoperative care of these patients was a most important factor in the ultimate results obtained. The following three points received particular emphasis:

1. *Diet.* In order to get the patient in as good condition as possible for surgery he was put on a high-protein, high-carbohydrate diet. Supplementary vitamins were

* Read before the Annual Meeting of the Society of the University Surgeons, February 7–9, 1946, New York City.
† Dr. Hertz has resumed his surgical practice in Allentown, Pennsylvania. Dr. Poer has resumed his surgical practice in Atlanta, Georgia.

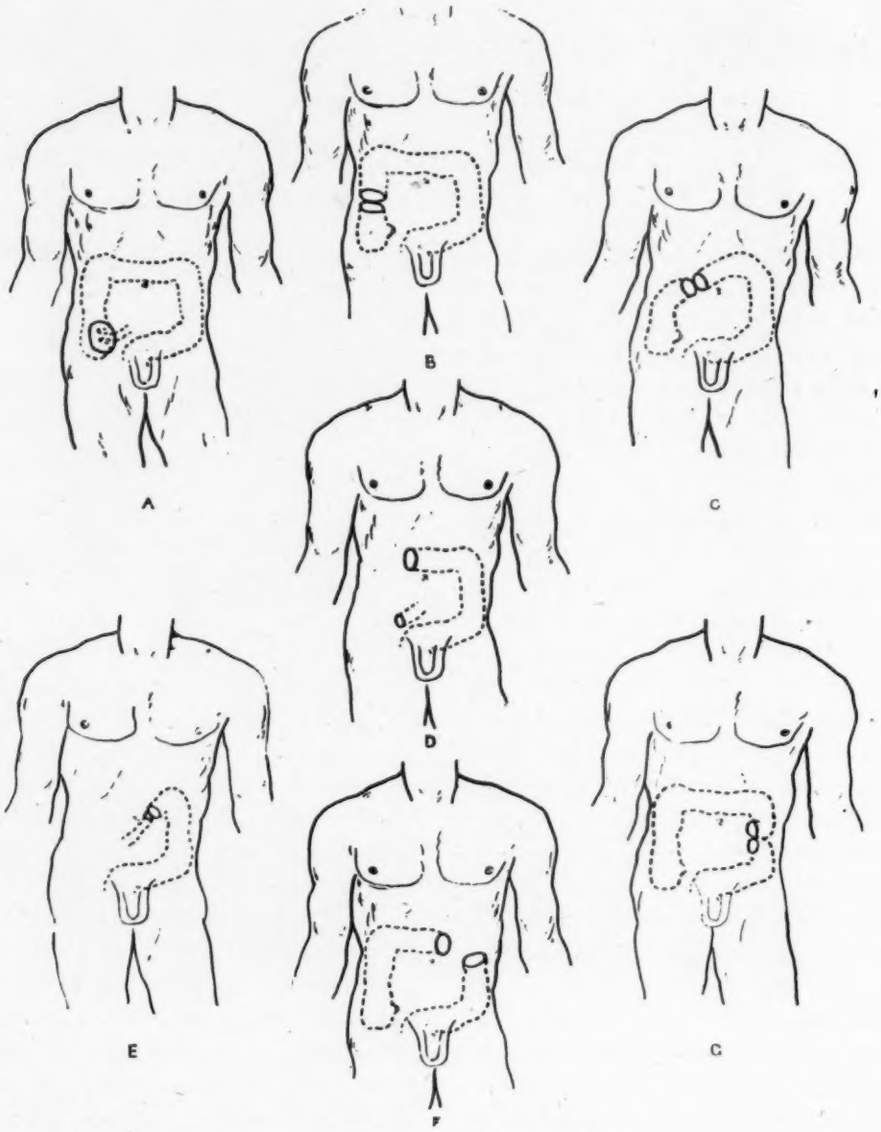


FIG. 1. Colostomy sites: A, exteriorization of wound of cecum with resulting intussusception of ileum into cecum closed by transverse suture extraperitoneally; B, exteriorization of wound of ascending colon; closed extraperitoneally after obliteration of spur; C, obstructive resection of hepatic flexure with creation of double-barreled colostomy; closed intraperitoneally by end-to-end anastomosis; D, resection of right half of colon with ileum and transverse colon brought out through separate incisions; closed intraperitoneally; E, resection of right half of colon with ileum and transverse colon brought out as double-barreled colostomy; closed extraperitoneally; F, resection of splenic flexure of colon with limbs brought out separately; closed intraperitoneally by end-to-end anastomosis; G, double-barreled sigmoid colostomy. This type was closed intraperitoneally by end-to-end anastomosis, or extraperitoneally, after crushing of spur, as indicated in Figures 2 and 3.

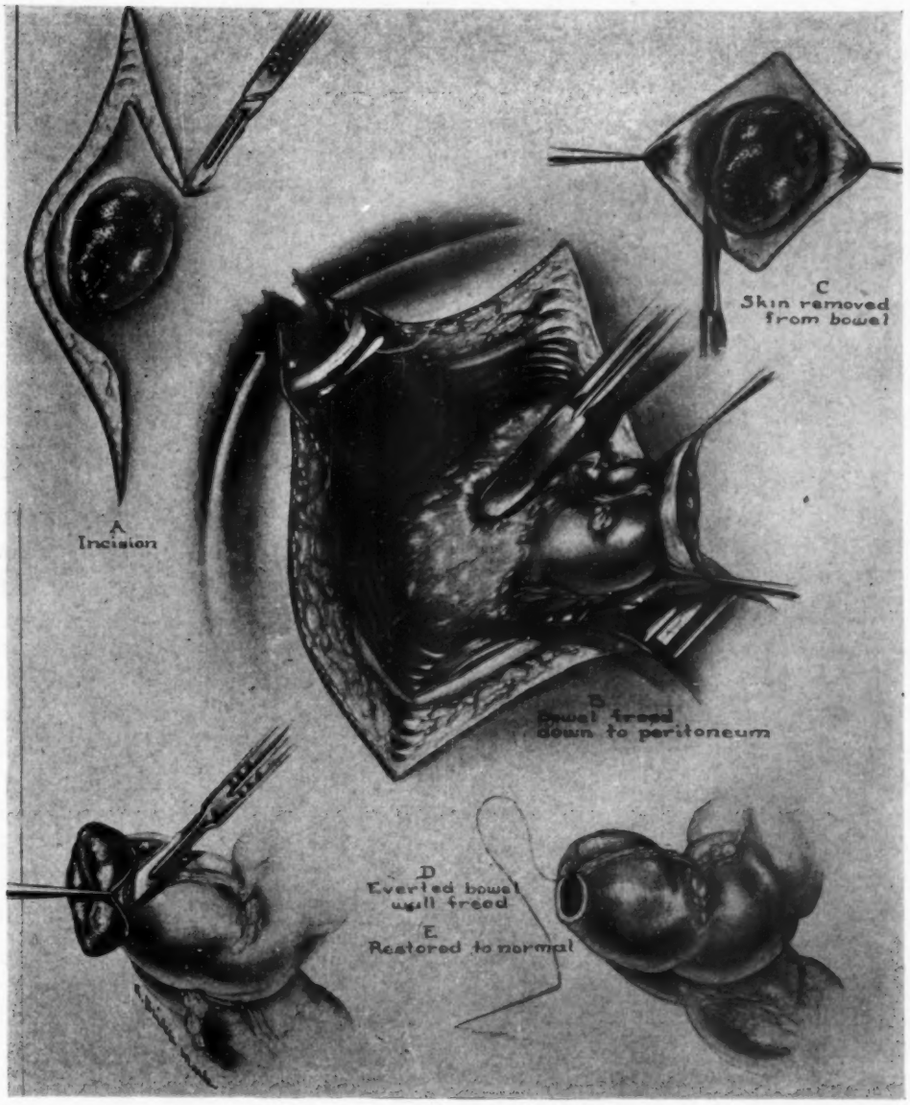


Fig. 2. Operative steps in closure of colostomy after obliteration of spur. A, elliptical incisions around stoma; B, dissection of bowel from fascia and muscle; C, excision of skin from stoma; D, everted bowel wall freed and turned back; E, transverse suture of stoma.

added as indicated. For the three days immediately preceding surgery he was placed on a low residue diet. During the twenty-four hours preceding surgery the patient received only clear liquids.

2. *Mechanical Cleansing of the Bowel.* At the time of arrival at this hospital, following a trip of varying length of time from overseas, many of these patients had a large amount of inspissated material in the distal loop. Accordingly, active measures were taken to clean this out. By using irrigations and enemas of water and oil this was accomplished. After the distal loop was completely cleaned out, it was irrigated three to five times weekly. In view of the fact that the patient, on arrival at this hospital, had had his colostomy for approximately four months it was usually found that the diameter of the distal loop had decreased moderately. It was believed that these frequent enemas would tend to restore the tone of this distal portion of the bowel and at the same time restore it to a more normal size. On the morning of operation both the proximal and distal loops

of the colostomy were irrigated with sterile saline solution until clear.

3. *Chemotherapy.* Sulfathalidine (phthalylsulfathiazole) was used in fifteen of these cases. It was given for a period of three to five days preoperatively. In view of the reports of Poth it was considered worth while to use this drug. In addition to its effect on the bacterial count, sulfathalidine also reduced the bulk of the feces and rendered them more liquid in consistency.

Operation. Elliptical skin incisions were made completely encircling the colostomy. (Fig. 2A.) These incisions were continued downstream toward the peritoneal cavity, separating the fascia and muscle from the bowel wall. The fascia was carefully and thoroughly exposed so that a satisfactory and strong closure could be effected later. (Fig. 2B.) In those cases in which the colostomy spur had been crushed by clamps, the peritoneal cavity was not opened. After separating the attached skin from the colostomy stoma (Fig. 2C) the cuff of everted bowel wall was carefully turned back into its normal position. (Fig. 2D.) Keene has stressed the value of this procedure. This reduced considerably the size of the defect to be closed. It was then possible to close this opening transversely. (Fig. 2E.) The first row was made with a Connell suture or a simple over-and-over suture. A second row of a continuous Cushing suture was used. The suture material used in these cases was No. 00 chromic catgut on an atraumatic needle. The peritoneum was then opened and the closed bowel returned to its normal position within the peritoneal cavity. (Fig. 3F.) It was our belief that this was an important step in the prevention of a postoperative incisional hernia. Dixon and Benson likewise advocated this return of the closed bowel to its normal location within the peritoneum. Pilcher and Nadeau, on the other hand, carefully refrained from entering the peritoneal cavity and instead placed the closed bowel between the peritoneum and the transversalis fascia. A careful abdominal wall closure was then performed in order to minimize the chances of herniation. (Fig. 3G.) The procedure which has just been described was also found suitable for closing those colostomies in which the colon injury had been exteriorized without the formation of a spur. In these cases, after restoring the everted cuff of mucous membrane to its normal position, a simple transverse closure in two layers was satisfactory.

As pointed out by Keene, there is much danger associated with the application of spur-crushing clamps in these combat injured soldiers. The limbs may have been rotated, the mesenteric border may be in the spur or another loop of bowel may be caught in the colostomy loop. For these and other reasons it was decided in our more recent cases that an intraperitoneal approach with more accurate visualization of the limbs of the colostomy was safer. Accordingly, the colostomy stoma was dissected free from the surrounding tissue as just described and the peritoneum was entered. The bowel was mobilized as well as possible so that its deformity could be studied and the method of closure determined. In those patients in whom a complete transsection of the colon had not been done a simple transverse suture sometimes was sufficient to produce an adequate lumen. In the other patients the colostomy limbs were reunited by means of either an end-to-end or a side-to-side anastomosis. In those patients in whom a side-to-side anastomosis was performed the two limbs of bowel were placed in an isoperistaltic position. In the majority of the intraperitoneal closures an end-to-end anastomosis was performed. The open method of anastomosis was used. After resecting a small segment of the ends of the bowel limbs, the anastomosis itself was completed by using two rows of continuous sutures of No. 00 chromic catgut on an atraumatic needle. The repaired colon was then returned to the peritoneal cavity and the abdominal wall closed in layers. In all of

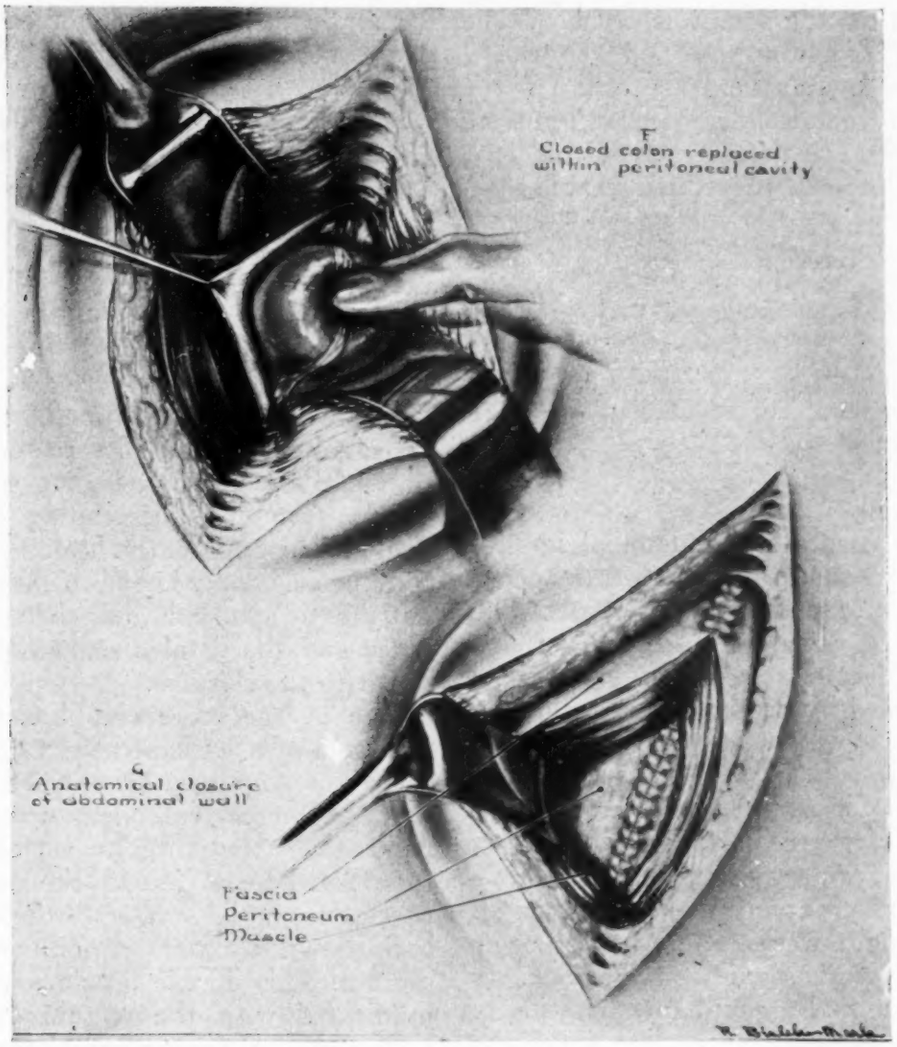


FIG. 3. Operative steps in closure of colostomy (*continued*). F, closed colon replaced within peritoneal cavity; G, abdominal wound closed in anatomic layers without drainage.

the cases the abdominal wall was closed without drainage.

Postoperative Care. This consisted of nothing by mouth for twenty-four to forty-eight hours. Mineral oil, 30 cc. twice daily, was started on the second or third day, and defecation usually occurred on the fourth or fifth day. A low residue diet was begun on the fourth day and a regular diet begun on the seventh to tenth day.

Complications. Few complications were encountered in this series of colostomy closures. In two of the patients in whom an end-to-end anastomosis had been performed an intestinal obstruction developed. In one of these it was only partial and subsided in a relatively short time. In the other case the pain was quite severe and the evidence pointed to a complete obstruction. A cecostomy was performed giving the patient immediate relief. Within twenty-four hours after the cecostomy was performed the patient began to pass gas per rectum. The cecostomy closed spontaneously.

Results. In this series thirty-two colostomies were closed, eighteen by an extraperitoneal method and fourteen by an intraperitoneal method. Of the former, twelve were closed as illustrated in Figures

2 and 3 after the spur was crushed. The remaining six had no spur and were closed by a simple transverse suture. Of the fourteen intraperitoneal closures, ten were done by the end-to-end method and four by the side-to-side procedure. (Table II.)

TABLE II
COLOSTOMY CLOSURES

	No.
Extraperitoneal	18
After spur crushed	12
Transverse suture—no spur	6
Intraperitoneal	14
End-to-end	10
Side-to-side	4
Total	32

In all patients the abdominal incision was closed primarily without drainage. In none did a wound infection result. This procedure of primary closure is at variance with the delayed closure of incisions as recommended by Pemberton and Black.

The postoperative convalescence was usually very satisfactory. Little cramp-like pain was noted except in the two patients described, with the partial and complete obstruction, respectively. There was no evidence of leakage at any of the anastomoses.

Six to eight weeks after the operation roentgenological studies were made. In some, a minimal amount of narrowing of the lumen was noted; in others there was none. Most of the patients were symptom-free. Four of them complained of occasional mild cramps in the region of the closure.

FISTULAS OF THE LARGE BOWEL

In eleven of the patients who arrived at this hospital from combat areas overseas, a fistula of one type or another was present. (Table III.) Some of these were simple, short, straight fistulas running from the buttock directly into the rectum. In others the tract was long, narrow and tortuous passing anterior to the coccyx and sacrum. The external openings of all of these fistulas were located in the skin of the buttocks or gluteal cleft. Ten of these communicated with the rectum and one with the descending colon. All of these cases represented combat injuries of the involved portion of large bowel. In the primary definitive treatment at the time of injury the soft tissue wounds were débrided and in most cases the wounds of the large bowel were closed. The fecal stream was diverted

TABLE III
FISTULAS OF LARGE BOWEL

Location	No.
Rectum	10
Descending colon	1
Total	11

from this repaired intestine by means of a proximal colostomy. In three of the cases of rectal fistulas and in the case of the fistula from the descending colon the wound had apparently healed and therefore the colostomy had been closed. Apparently satisfactory healing had not taken place and the fistulas redeveloped subsequent to the closures.

One of the more complicated fistulas consisted of a Y-shaped tract and is illustrated in Figure 4. The tract from the coccygeal area extended upward to a point over the anterior surface of the sacrum where it joined the other tract passing from the surface of the right buttock down through a foramen of the sacrum. This double fistulous tract communicated with the rectum at a point approximately four inches above the anal orifice. Figure 5 illustrates the only fistula which did not communicate with the rectum. This officer sustained a rifle bullet wound which perforated his descending colon and passed out of the body in the left flank through a defect which it created in the posterior crest of the ilium.

Most of these fistulas had been draining for a relatively long period of time. Some of them were treated elsewhere by means of expectant observation. It is our strong conviction that few, if any, will heal spontaneously. It is because of this opinion that we wish to present our management of these cases. Nothing original is claimed for the procedure. It is merely desired to emphasize the fact that surgical treatment is necessary to cure these fistulas.

Management. Briefly stated, management of these patients consisted of operation upon the fistulous tract after the patient was in a satisfactory physical condition. The operation itself consisted of unroofing the entire tract and mobilizing the involved rectum or descending colon sufficiently so that the internal opening in the bowel could be closed without tension. The postoperative care consisted of permitting these wounds to heal by secondary intention. In most cases the resultant scar was later revised by excision and primary plastic closure.

In those patients in whom a proximal colostomy was still functioning, the fecal stream was thereby diverted from the freshly sutured bowel wall and normal healing was to be expected. In the four patients in whom the colostomies had already been closed the question was raised as to whether or not a new colostomy should be formed. In all of these cases it was decided to attempt a cure without resorting to this more radical procedure.

Preoperative Care. The usual principles of good preoperative care were followed. High-protein, high-carbohydrate diet and supplementary vitamins were prescribed as indicated. The lower bowel was thoroughly cleansed mechanically by means of irrigating solutions of normal saline or potassium permanganate. In those patients in whom the colostomy had been closed earlier the diet was restricted during the last three preoperative days to a nonresidue one. In addition, this latter group of patients was given sulfathalidine for three to five days preoperatively.

At times it was very apparent that the fistulous tract communicated with the rectum. At other times demonstration of this fact was not always simple. A satisfactory method of demonstrating the internal opening consisted of the passage of a catheter into the tract as far as it would go. With a proctoscope in place the interior of the rectum was then explored for any evidence of an internal opening. Sometimes this could be picked up readily by the appearance of a small umbilicated structure or a teat-like deformity in the rectal wall. A water solution of a dye such as methylene blue was then injected through the catheter slowly. The appearance of the colored solution within the rectum demonstrated both the fact that the fistula connected with the rectum and the exact position of the internal opening.

Surgical Treatment. The patient was placed on the operating table in the prone position and the buttocks were elevated. The fistulous tract was then uncovered by means of an incision over it. It was frequently necessary to resect the coccyx and sometimes a portion of the sacrum. A sufficient amount of bone was removed so that the internal opening into the rectum could be visualized and sutured. In several cases the fistulous tract extended in a horizontal fashion from the buttock to the rectum. (Fig. 4.) In these cases a portion of the lateral half of the sacrum had to be removed so as to expose the high internal opening. In the case illustrated in Figure 4 a small ureteral catheter was manipulated through the proctoscope and into the internal opening. The catheter was then advanced until it emerged through the external opening on the right buttock. This was of great aid in unroofing this particular portion of the fistula. When the dissection from the external opening had advanced to the sacrum it was found that the tract passed through a small sacral foramen. This portion of the sacrum was resected. After incision of the fascia propria the small internal opening was visualized at the point where the catheter entered the rectal wall. The catheter was removed and the small opening closed by two rows of Lembert sutures.

As a rule it was found desirable to free the rectum from all attachments for a distance of at least 2 or 3 cm. around the internal opening. The opening itself was closed in one of several ways. For the small ones a purse-string suture, reinforced by a second suture, was all that was necessary. In others the opening was closed in a trans-

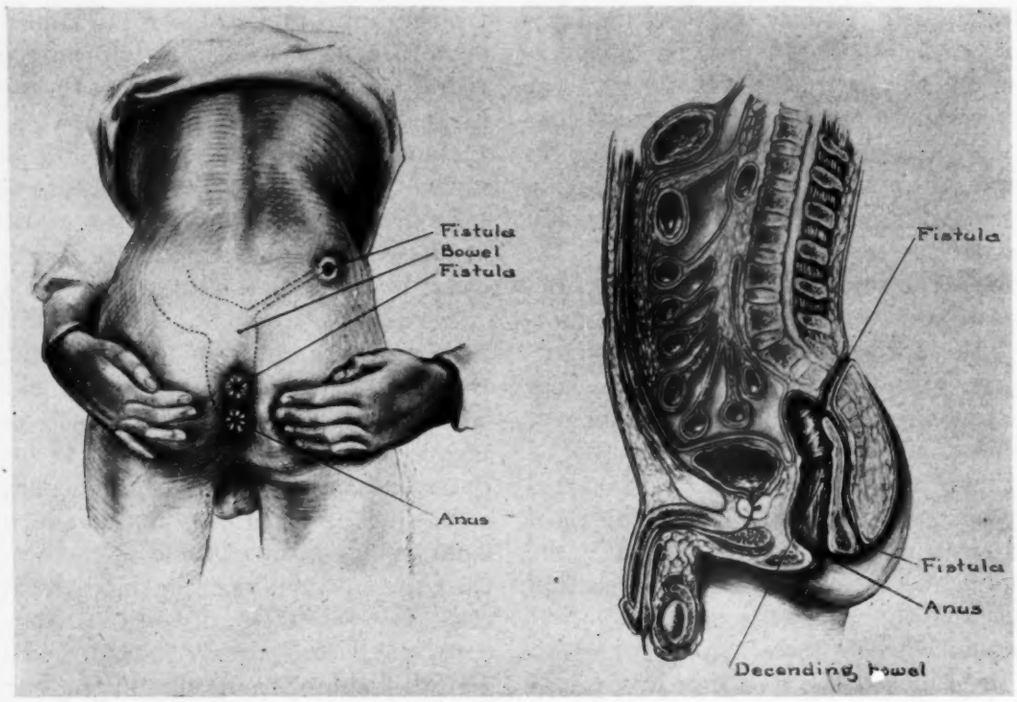


FIG. 4. Rectal fistula with two external openings; one in gluteal cleft posterior to anus, the other in right buttock.

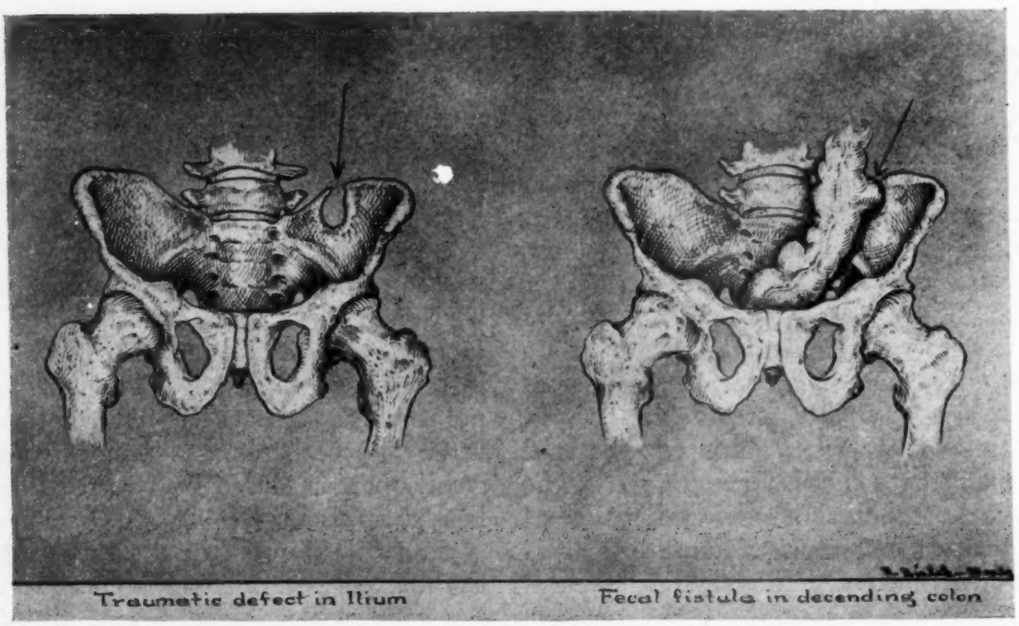


FIG. 5. Fistula, from descending colon to skin of left flank, passing through defect in ilium created by bullet.

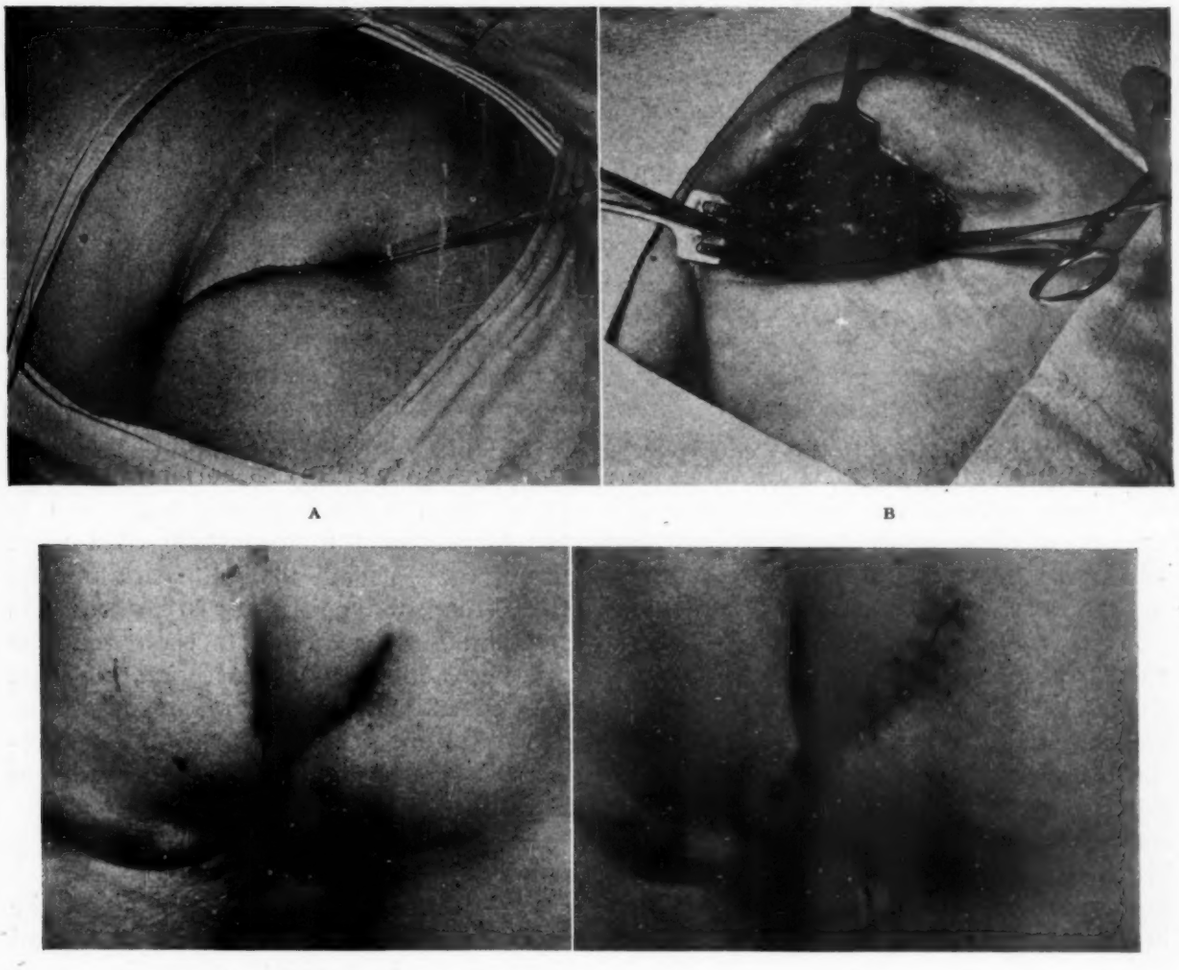


FIG. 6. A, demonstration of external opening in right buttock; probe passed directly into rectum; B, exposure of internal opening in rectum; this was sutured transversely; C, complete healing by secondary intention two months postoperatively; D, two weeks after plastic revision of scar.

verse manner using two rows of sutures which inverted the mucous membrane into the lumen. No effort was made to close the wound created by unroofing the fistulous tract. The sides and base of the wound were lined with xeroform gauze and the cavity itself lightly packed with fluffed gauze.

In the four patients in whom the colostomy was no longer present the anal sphincters were carefully stretched while the patient was still on the operating table. It was believed that this maneuver might aid in preventing the development of gaseous pressure within the lumen of the rectum.

One of the fistulous tracts extended from the left flank through a defect in the ilium into the descending colon. This case is illustrated in Figure 5. The officer's transverse colostomy had previously been closed overseas because the fistulous tract had ceased draining. At the time the patient arrived at this hospital the external opening was very small. Exploration of this tract demonstrated conclusively that it connected with the descending colon. At operation this posterior tract was packed under sterile precautions. Through an oblique incision made just medial to the left anterior superior spine of the ilium, an extraperitoneal exposure of the posterior surface of the descending colon was made. This enabled the internal opening in the

colon to be visualized and closed. The anterior abdominal incision was closed without drainage. The sterile dressing in the posterior wound was then removed and a Penrose drain inserted through this wound to the site of closure of the internal opening. The anterior wound healed without any complications and the posterior wound was completely healed in three weeks. The posterior scar was later revised successfully.

Postoperative Care. The patients who had colostomies were allowed to resume a regular diet as soon as they desired it. In the four patients in whom colostomies were no longer present the postoperative diet was one of clear liquids for three days. For the next week a low residue diet was ordered. After this time the patient was allowed to eat what he desired. Rectal tubes were used carefully if there was any suggestion of gas or feces accumulating in the rectum. The wound itself was dressed for the first time on the third or fourth postoperative day. Thereafter dressings were changed every twenty-four to forty-eight hours. The wounds were irrigated and kept clean. In all cases the wounds filled in gradually and without recurrence of a fistula.

These wounds usually healed with an irregular scar, frequently manifested by a valley-like appearance. In most cases this scar was revised by excision and a primary plastic closure. Healing by primary intention resulted with restoration of the normal contour of the skin surface. (Fig. 6.)

Results and Comments. This series consists of eleven soldiers who had fistulas of the lower large bowel. All of these fistulas were treated in a similar manner and all went on to a complete cure. The length of time necessary for complete healing of the wound surgically created at the time of the closure of the internal opening varied approximately with the size of the wound itself. The larger defects took three months in which to heal completely. The smaller wounds were healed in a month's time. No complications were encountered in any of these cases.

It is very interesting that in four of these patients the proximal colostomy had been closed overseas. Despite the fact that the fecal stream was therefore not diverted from the closed internal openings there were no recurrences of the fistulas. The successful cure in these cases probably depended upon a number of factors, of which the following may have been the most important: (1) Careful closure of the bowel opening without tension of any sort; this was made possible by adequate mobilization of the bowel; (2) reduction in the bacterial count of the feces and in the bulk of the feces and the production of a more liquid fecal stream by sulfathalidine and the preoperative dietary regimen; (3) stretching of the anal sphincter at the time of operation and (4) postoperative care with special emphasis on maintaining adequate drainage of the wound and the prevention of the accumulation of gas and feces in the rectum.

SUMMARY

1. A presentation has been made of the experience gained at an Army General Hospital in the Zone of Interior in closing thirty-two colostomies and eleven fistulas of the rectum and descending colon.

2. Both intraperitoneal and extraperitoneal methods were used in the colostomy closures. All abdominal incisions were closed without drainage. No deaths or failures occurred. No wound infection developed.

3. The fistulas were successfully cured by operation. This consisted of unroofing the tract, closing the internal opening in the bowel and allowing the soft tissue wound to fill in secondarily. The resulting scar was later revised so as to produce a good cosmetic result.

4. Spontaneous closure of fistulas of the large bowel such as encountered in this series is rare. It is desired to emphasize the necessity of surgical treatment to effect a cure.

5. After an extraperitoneal closure of a colostomy it is suggested that the bowel be replaced within the peritoneal cavity so that an accurate and careful abdominal wall closure can be effected, thereby minimizing the risk of incisional hernia.

6. It is suggested that an intraperitoneal approach to the closure of colostomies is a safe and preferable one in war surgery. This suggestion is made in view of the hazards associated with closing colostomies which were created under battle conditions and whose exact anatomy is unknown to the surgeon confronted with the task of closing them. A visual approach is better than a blind approach.

REFERENCES

1. Dixon, C. F. and Benson, R. E. Closure of colonic stomas. *Ann Surg.*, 120: 562–571, 1944.
2. Keene, C. H. Reconstruction of wounds of the colon. *Surg., Gynec. & Obst.*, 79: 544–551, 1944.
3. Pemberton, J. de J. and Black, B. M. Delayed closure of incisions made at closure of colonic stomas. *Surg., Gynec. & Obst.*, 76: 385–390, 1943.
4. Pilcher, Lewis S. and Nadeau, O. E. Extraperitoneal closure of colostomy. Report of 15 cases. *Mil. Surgeon*, 97: 190–198, 1945.
5. Poth, E. J. Succinyl-sulfathiazole and phthalylsulfathiazole in surgery of the colon. *Surgery*, 17: 773–780, 1945.

A fistulous communication between the bladder and bowel is uncommon but not rare. The cause is usually trauma, infection, or neoplastic disease. Diverticulitis of the sigmoid, with perforation and abscess formation against the bladder wall, may cause a persistent fistula.

From "Operations of General Surgery" by Thomas G. Orr (W. B. Saunders Company).

PRIMARY LYMPHOSARCOMA OF THE STOMACH*

STATISTICAL SUMMARY AND CASE REPORT OF A FIVE-YEAR CURE

JOHN B. O'DONOGHUE, M.D. AND MAURICE B. JACOBS, M.D.
CHICAGO, ILLINOIS

IN a review of the literature up to 1937, Taylor[1] collected one hundred forty-seven proven cases of primary lympho-

FIG. 1. Roentgenogram showing large filling defect involving the pars prepylorica and the distal half of the pars media of the stomach.

sarcoma of the stomach. To this group he added five cases from the Presbyterian Hospital of New York making a total of one hundred fifty-two cases. In the interim nine years several series and numerous individual case reports have been added to the growing literature of this subject.

It is our thought that a present day summary of this type of neoplasm may be of interest and would desire to include in this communication the case history of a patient previously reported,[2] who underwent operation for resection of a primary lymphosarcoma of the stomach and is alive and well five and one-half years later.

CASE REPORT

A. D., a white male, aged sixty-three, was admitted April 22, 1941 to the Cook County Hospital (surgical service of Dr. J. B. O'Donoghue) with complaints of anorexia and vomiting following the ingestion of food of two months' duration.

Marked generalized weakness of six weeks' duration was present. A weight loss of 50 pounds had occurred during the past year.

The essential physicopathological findings were limited to the abdomen which was scaphoid; tenderness on palpation was present in the epigastrium. No masses were palpable, although the liver edge was just made out below the right costal margin. Examination of the blood and urine were within normal limits. Gastric analysis by the Ewald test meal revealed an absence of free hydrochloric acid; the combined acid, however, was 53 degrees. Blood was absent both grossly and chemically from the stomach contents and also from the stool.

A barium meal was given and a large, rigid superimposable defect involving the entire prepyloric and the distal half of the pars media of the stomach was demonstrated. The opinion was expressed that the lesion was a far advanced carcinoma. Gastroscopic examination confirmed the roentgenological findings. (Fig. 1.)

On May 6, 1941, under cyclopropane anesthesia celiotomy was performed and a large firm mass involving the pyloric and prepyloric portions of the stomach was present. No apparent metastasis to the liver or the periaortic lymph nodes were present, accordingly, a high subtotal gastric resection (Pólya type) was performed.

The resected specimen was submitted to the Department of Surgical Pathology and was described as follows: Grossly: "In the mucosa of the distal end of the stomach is a 5.5 by 6.5 cm. ulcer located on the lesser curvature.

* From the Departments of Surgery, The Cook County Hospital, Loyola University School of Medicine, and the Cook County Graduate School of Medicine, Chicago, Ill.

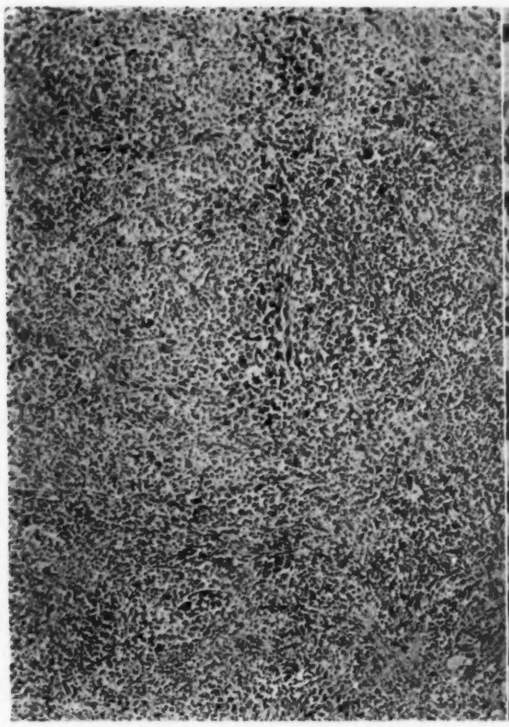


FIG. 2. Low power photomicrograph taken from ulcerated area of the stomach showing diffuse lymphocytic infiltration of the stomach wall (hematoxylin-eosin stain × 99).

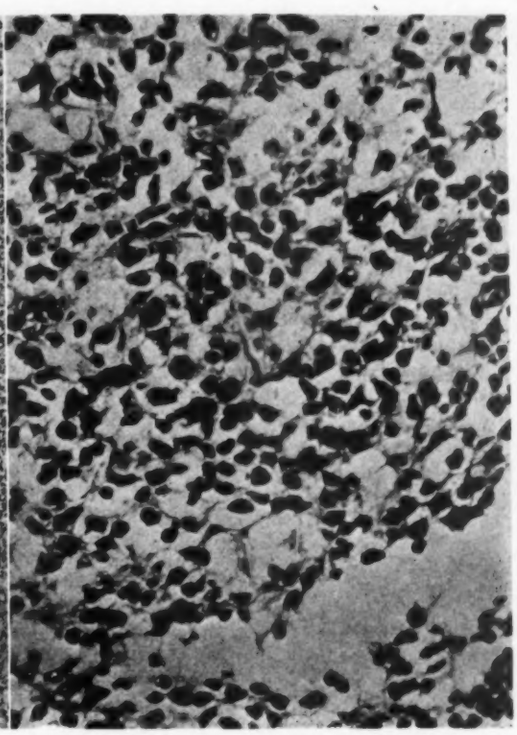


FIG. 3. High power photomicrograph showing infiltration of stomach wall by lymphocytes. The nuclei are rich in chromatin and are surrounded by a narrow rim of a pale staining cytoplasm. Variations in size and shape are present (hematoxylin-eosin stain × 670).

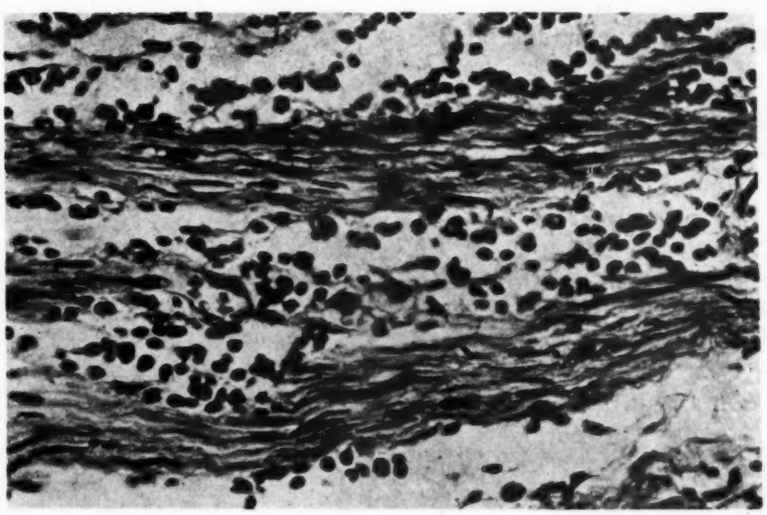


FIG. 4. High power photomicrograph showing separation of the muscle bundles of the stomach by invasion of the lymphosarcomatons cells (hematoxylin-eosin stain × 670).

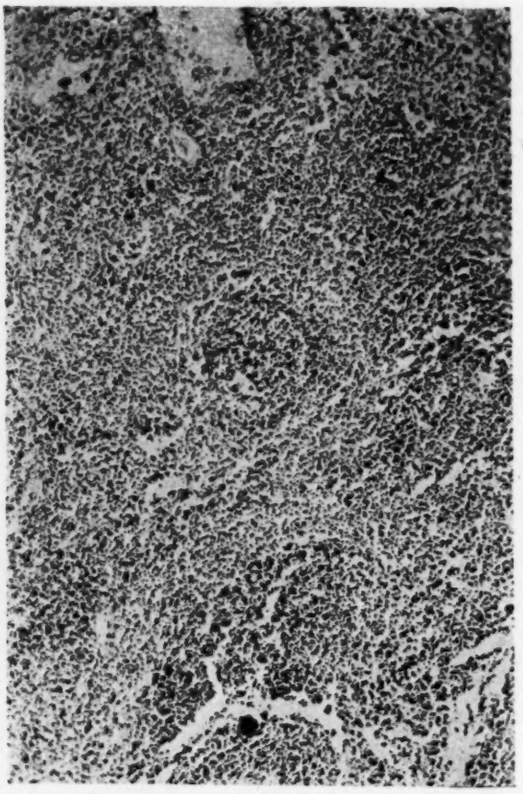


FIG. 5. Low power photomicrograph of a perigastric lymph node. Only one lymph follicle is present. The remainder of the architecture has been replaced by lymphosarcomatous elements (hematoxylin-eosin stain × 99).

The edges of this defect are firm and rolled and the base is clean. Just proximal to the ulcer is a slight narrowing of the lumen and another ulcer measuring 2.5 cm. in diameter is present whose edges are more irregular. Several lymph nodes the largest measuring up to 1.2 cm. in diameter are attached to the pyloric end. Microscopically, sections taken from the ulcerated area reveal a reticulum cell sarcoma of the stomach."

The immediate postoperative course was entirely uneventful and the patient was discharged from the hospital on his fourteenth postoperative day. He was referred for postoperative irradiation and in the ensuing three months received twenty-one treatments, each consisting of 300 r units, the rays being administered over five fields.

Six months after operation the patient had gained 30 pounds in weight, felt stronger and was working. Examination of the stomach by barium meal on December 5, 1941, showed a well functioning stoma and no apparent neoplastic involvement of the stomach (Figs. 2 to 6.)

Over five years have elapsed since the patient underwent resection. He has entirely regained his loss of weight, feels stronger and is working at odd tasks. A barium meal given on September 3, 1946, is similar to the examination performed in December 1941. (Fig. 7.)

COMMENTS

Gastric sarcoma comprises from 1 to 2 per cent of all gastric neoplasms. The lymphosarcoma type is the most common and comprises from 50 to 60 per cent. Considerable disagreement in the terminology and classification of neoplastic and neoplastic-like lesions of the lymphoid system exists because of the lack of knowledge in regard to the etiology and histogenesis of these lesions.

Ewing[3] classifies sarcoma of the gastrointestinal tract as (1) spindle cell myosarcoma, (2) miscellaneous round cell or mixed cell alveolar sarcoma and (3) lymphosarcoma. Madding and Walters[4] divide the lymphosarcoma type into two forms: (1) reticulum cell sarcoma or (the large round cell lymphosarcoma) and (2) malignant lymphocytoma or (the small round cell lymphosarcoma). This differentization is emphasized as being of clinical significance inasmuch as the two forms differ in their response to roentgen therapy and the prognosis for survival is different (Table 1.)

From Table 1 it will be seen that a total of one hundred cases of lymphosarcoma of the stomach have been reported by various authors in the period from March, 1937, to January 1, 1946. This reflects the increased incidence of surgical procedures upon the stomach in the past two decades inasmuch as Taylor's series of 152 cases comprises the thirty-three year period from 1893 to 1937. The largest group of patients reported from a single source in our collected series is from the Mayo Clinic where forty-one cases were observed during a period of thirty years.

The prognosis for survival following

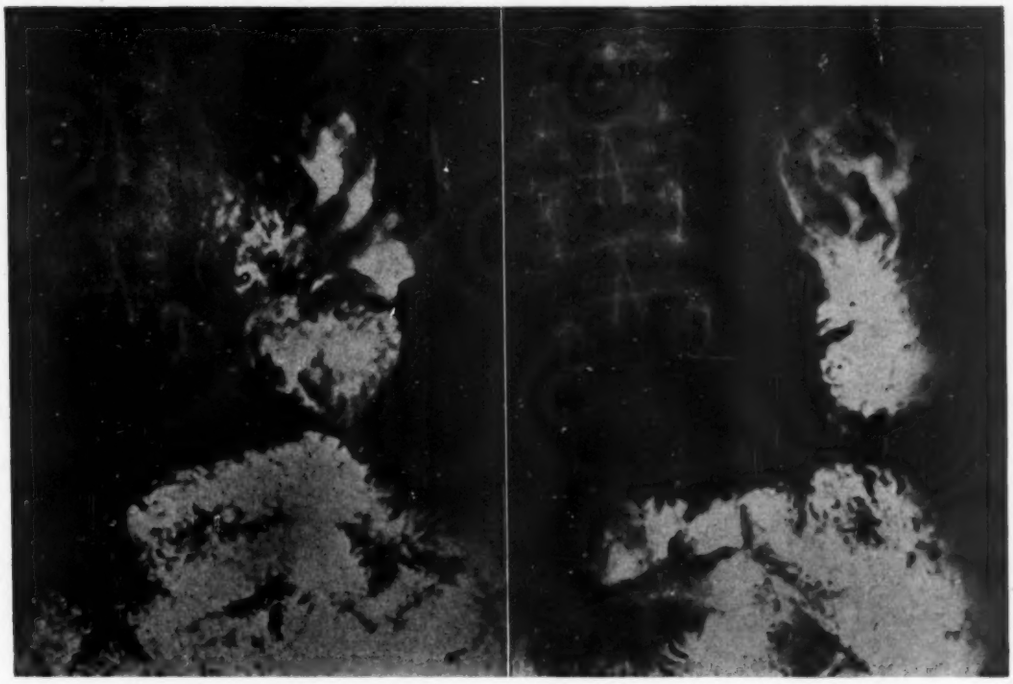


Fig. 6. Roentgenogram taken seven months after operation showing stoma of stomach with no apparent neoplastic involvement.

Fig. 7. Roentgenogram taken five years after operation showing a high subtotal gastric resection with a well functioning stoma and no apparent neoplastic involvement.

removal of a primary lymphosarcomatous lesion of the stomach is better than for carcinoma. The longest span of life recorded to date is in the patient reported by Collins and Carmody[5] who is alive and well twenty-two years after resection. In Taylor's series, thirteen or 11.7 per cent were alive five years following operation. Madding and Walters found that patients with reticulum cell sarcoma treated by surgical procedure had an average life span of 3.58 years, whereas patients with malignant lymphocytoma had an average life span of 5.6 years.

The clinical features of lymphosarcoma of the stomach have previously been reported in publications by Pack and McNeer,[6] Madding and Walters,[4] Yarniss and Colp[26] and others.[2,27,29,30] Inasmuch as there is nothing new to be added at this time the reader is referred to their articles.

With the improvement of radiation therapy in recent years marked regression of far advanced lesions often occurs. Desjardins[7] has stated that "if lymphosarcoma could be diagnosed early, most of them could be cured by radiation therapy alone." Early diagnosis of tumors of the stomach can only be attained by medical education of the patient to the fact that he should consult his physician for any digestive disturbance early in its course, and secondly the physician through the medium of a detailed history and a complete physical examination followed by radiological and gastroscopic study will usually succeed in arriving at the correct diagnosis and have adequate therapy, namely surgical intervention instituted.

With the advancement of gastroscopic study we believe that one of the greatest aids in making an earlier diagnosis will be available, inasmuch as the involvement of the stomach wall by a lymphosarcoma throws up rugae which are markedly exaggerated and have been described as lobulated without involvement of the mucosa. This finding, together with or without a roentgenological deformity of the stomach in a patient with an organic gastric complaint, justifies a laporatomy since surgical

treatment supplemented by radiation therapy can and does offer these patients a cure.

SUMMARY

1. One hundred cases of primary lymphosarcoma of the stomach have been collected from the literature during the period of March, 1937, to January 1, 1946.

2. A case report is presented of a patient with lymphosarcoma of the stomach who is alive and well five and one-half years following resection.

3. Only through the earlier diagnosis of tumors of the stomach can adequate therapy, namely surgery, be instrumental in the attainment of a cure.

TABLE 1
REPORTED CASES OF LYMPHOSARCOMA OF THE STOMACH MARCH, 1937 TO JANUARY 1, 1946

Year	Author	No. of Cases
1937	Venable[8]	1
1937	Cabot Case No. 23512[9]	1
1937	Golob[10]	1
1937	Zaph, Olin and Kirshbaum[11]	1
1938	Howard and Speer[12]	1
1938	Cabot Case No. 24501[14]	1
1938	Johnson, Lee, Hwong and Case[13]	1
1939	Dumond[15]	1
1939	Archer and Cooper[16]	3
1940	Gabrielli[17]	1
1940	Hochman[18]	2
1940	Ritter[19]	1
1940	Hubeny and Delano[20]	1
1940	Madding and Walters[4]	41
1941	Pund and Stelling[21]	3
1941	Yarnis[22]	1
1941	Koucky, Beck and Atlas[23]	1
1941	Giere[24]	1
1942	O'Donoghue and Jacobs[2]	1
1943	Doran and Doran[25]	1
1943	Yarnis and Colp[26]	8
1943	Schroeder and Schaltenberg[27]	6
1944	Paul and Parkins[28]	1
1944	Marshall and Aronoff[29]	5
1944	Rafsky, Katz and Krieger[30]	11
1944	Porritt[31]	1
1944	Puts[32]	2
1945	Cardon and Greenebaum[33]	1
	Total	100

REFERENCES

1. Taylor, E. S. Primary lymphosarcoma of the stomach. *Ann. Surg.*, 110: 200–221, 1939.
2. O'Donoghue, J. B. and Jacobs, M. B. Lymphosarcoma of the stomach. *Am. J. Surg.*, 58: 246–253, 1942.
3. Ewing, J. Neoplastic Diseases. 3rd ed. Philadelphia, 1928. W. B. Saunders & Co.
4. Madding, J. and Walters, W. Primary lymphosarcoma of the stomach. *Arch. Surg.*, 40: 120–134, 1940.
5. Collins, E. N. and Carmody, M. G. Lymphosarcoma of the stomach. *Am. J. Digest. Dis.*, 3: 884–888, 1937.
6. Pack, G. T. and McNeer, G. Sarcoma of the stomach. *Ann. Surg.*, 101: 1,206–1,224, 1935.
7. Desjardins, A. U. Quoted by Eusterman, G. and Balfour, D. C. The Stomach and Duodenum. Philadelphia, 1935. W. B. Saunders & Co.
8. Venable, D. A. Primary lymphosarcoma. *Texas State J. Med.*, 33: 327–331, 1937.
9. Cabot. Retothel sarcoma of the stomach. *New England J. Med.*, 217: 1,049–1,051, 1937.
10. Goleb, M. Lymphosarcoma of the stomach. *Rev. Gastroenterol.*, 4: 228–229, 1937.
11. Zaph, S. D., Olin, H. A. and Kirshbaum, J. D. Lymphosarcoma of the stomach, clinical and roentgenological aspects. *Am. J. Surg.*, 36: 476–486, 1937.
12. Howard, C. and Speer, F. D. Lymphosarcoma of the stomach. *N. Y. M. Coll. & Flower Hosp. Bull.*, 1: 151–154, 1938.
13. Johnson, T. A., Lee, W. E., Hwong, M. S. and Case, E. A. Lymphosarcoma of the stomach. *Internat. Clin.*, 1: 261–265, 1939.
14. Cabot. Lymphosarcoma of the stomach. *New England J. Med.*, 219: 961–963, 1938.
15. Dumond, G. A. Un cas de lymphosarcoma gastrique perfore. *Lyon méd.*, 163: 769–776, 1939.
16. Archer, V. W. and Cooper, G. Jr. Lymphosarcoma of the stomach. *Am. J. Roentgenol.*, 42: 332–340, 1939.
17. Gabrielli, S. Pecularita cliniche di un case di sarcoma gastrico primitivo. *Minerva med.*, 2: 333–338, 1940.
18. Hochman, A. Sarcoma of the stomach. *Lancet*, 1: 362–363, 1940.
19. Ritter, S. A. Primary lymphosarcoma of the stomach. *Am. J. Surg.*, 47: 131–134, 1940.
20. Hubeny, M. A. and Delano, P. J. Retothel sarcoma of the stomach. *Radiology*, 34: 366, 1940.
21. Pund, E. R. and Stelling, F. H. Lymphosarcoma, report of three apparently cured cases. *Am. J. Surg.*, 52: 50–54, 1941.
22. Yarnis, H. Lymphosarcoma of the stomach. *J. Mt. Sinai Hosp.*, 8: 305–307, 1941.
23. Koucky, J. D., Beck, W. C. and Atlas, J. Acute perforation of lymphosarcomatous ulcer of the stomach. *Ann. Surg.*, 114: 1,112–1,116, 1941.
24. Giere, C. N. Lymphosarcoma, diagnosed gastroscopically. *J. A. M. A.*, 117: 173–175, 1941.
25. Doran, W. and Doran, W. T. Jr. Lymphosarcoma of the stomach with perforation. *Am. J. Surg.*, 61: 136–137, 1943.

26. Yarnis, H. and Colp, R. Lymphosarcoma of the stomach. *Rev. Gastroenterol.*, 1: 1,022–1,039, 1943.
27. Schroeder, G. F. and Schaltenberg, H. J. Sarcoma of the stomach. *Arch. Surg.*, 47: 8–19, 1943.
28. Paul, W. D. and Parkins, G. L. Lymphosarcoma of the stomach. *Rev. Gastroenterol.*, 3: 214–217, 1944.
29. Marshall, S. F. and Aronoff, B. L. Tumors of the stomach. *S. Clin. North America*, 24: 607–617, 1944.
30. Rafsky, H. A., Katz, H. and Krieger, C. L. Varied clinical manifestations of lymphosarcoma of the stomach. *Rev. Gastroenterol.*, 3: 297–305, 1944.
31. Porritt, A. E. Sarcoma of the stomach. *Brit. J. Surg.*, 31: 395–398, 1944.
32. Puts, H. H. Sarcoma of the stomach. *Bull. Vancouver M. A.*, 20: 318–321, 1944.
33. Cardon, L. and Greenebaum, R. S. Lymphosarcoma of the stomach. *Am. J. Digest. Dis. & Nutrition*, 12: 339, 1945.

In many instances cancer recurs on the site of original operation; this may be several years after the original treatment and is not due to metastasis, but probably is caused by some extensions which were not removed.

From "Metastases Medical and Surgical" by Malford W. Thewlis (Charlotte Medical Press).

LATE RESULTS IN SURGERY FOR DECUBITUS ULCERS

MAJOR DONALD E. BARKER*
MEDICAL CORPS, ARMY OF THE UNITED STATES

THE early results in surgical repair of decubitus ulcers has been excellent. Reports by many observers, Lamon and Alexander,[1] Scoville,[2] White et al.,[3] Barker,[4] Barker, Elkins and Poer[5] show that the decubitus ulcer can be cured in a short time by surgery. However, these reports on the whole deal with the early observations following surgery. Of the eighty patients operated on to date, a series of twenty cases have been observed for a period of one to one and one-half years after surgery. A summary of this group is herewith given.

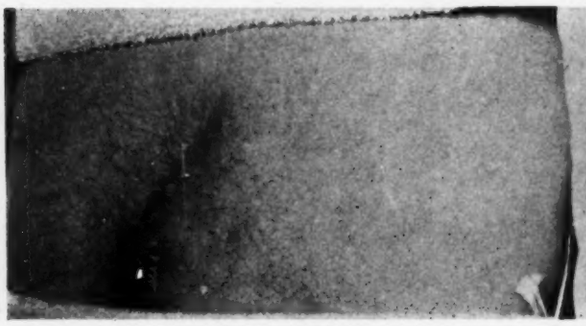


FIG. 1. Ulcer one and one-half years after closure.

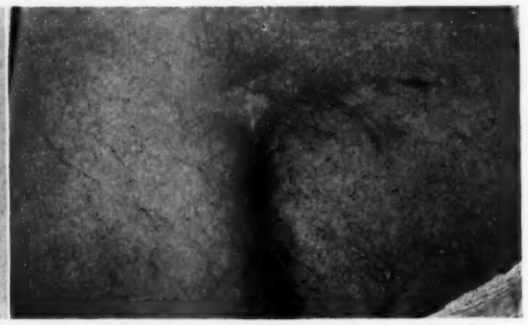


FIG. 2. Another ulcer one and one-half years after closure.

In the small ulcer, excision and closure has proved a good method in all of the cases employed. In none of the five of these patients has there been a breakdown. Figure 1 shows an ulcer one and one-half years after closure; Figure 2 shows another, one and one-half years after closure.

The late results in grafts to the sacrum have not been as heartening. Of the ten in this series, five have broken down repeatedly in small areas and later required excision and closure. Figure 3 shows a large ulcer preoperatively. Figure 4 shows the same ulcer ten days postoperatively with 100 per cent take. Figure 5 shows the same ulcer one year later with the breakdown ulcer with the ultimate breakdown one year later. Skin grafting in the ulcer patient should be reserved for those patients with large defects or those in whom a prolonged operation would be contraindicated. In observations of more than 150 patients it is the authors' belief that early skin grafting is beneficial to the patient and also reduces nursing care. Five of these early patients could not have withstood a radical closure at the time the grafting was done. In some places where grafting is not employed the patients are often delayed up to six months for surgery because the clinical condition does not permit surgery. At present we are using huge flaps to fill in the defects in patients that are in good clinical condition; however, observations have not been for a long enough period on these patients to make any definite conclusions.

In treatment of hip ulcers the use of a flap from the surrounding area is the method of choice. Early in the work we tried excision and closure, but due to the suture line lying directly over the trochanter a great many of these broke down immediately after operation. Figure 8

* Now stationed at Beaumont General Hospital, El Paso, Texas.

3

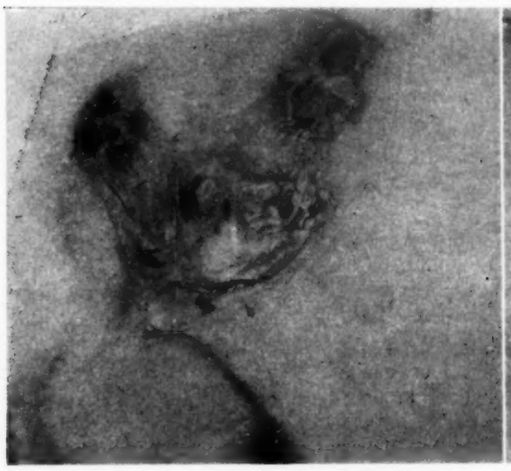
4

5

6

FIG. 3. Ulcer preoperatively.
FIG. 5. Ulcer one year later.

FIG. 4. Same ulcer ten days postoperatively.
FIG. 6. Result of excision of graft.



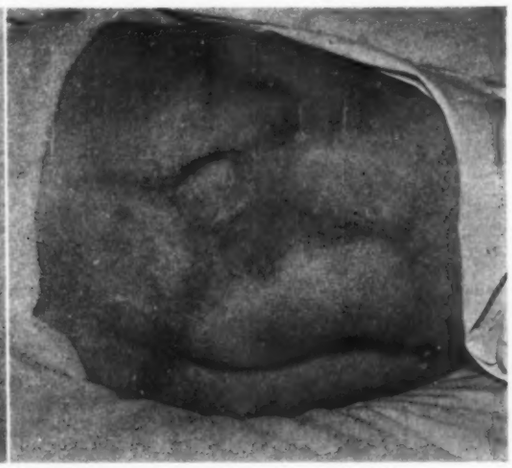


FIG. 7. Breakdown after one year.

FIG. 8. Hip ulcer one year after flap.

shows the results of a flap to the hip and graft of the donor area one year after surgery. In none of the five patients observed for this period has there been any breakdown of the flap.

CONCLUSIONS

Of eighty cases, twenty patients with decubitus ulcers have been observed for one to one and one-half years following surgery. On the whole, the results by excision and closure and the use of flaps have been excellent. Grafting, however, should be reserved for patients that are in such poor clinical condition that extensive surgery and blood loss would be contraindicated. Ulcers which have been grafted will ultimately break down and should be excised and closed when the clinical condition permits.

REFERENCES

1. Lamon, John D. and Alexander, Eben. Secondary closure of decubitus ulcers with aid of penicillin. *J. A. M. A.*, 127: 396, 1945.
2. Scoville, W. B. Personal communication.
3. White, J. C., Hudson, H. W. and Kennard, H. E. Treatment of bedsores by total excision with plastic closure. *U. S. Nav. M. Bull.*, 45: 454, 1945.
4. Barker, Donald E. Surgical treatment of decubitus ulcers. *J. A. M. A.*, 129: 160, 1945.
5. Barker, D. E., Elkins, C. W., Poer, D. H. Methods of closure of decubitus ulcers in the paraplegic patient. *Ann. Surg.*, 123: 523, 1946.

The response to the treatment of varicose ulceration depends on its duration, the extent of the ulceration, and the condition of the surrounding tissues in terms of scarring, phlebitis and lymphatic obstruction.

From "Minor Surgery" edited by Humphry Rolleston and Alan Moncrieff (Philosophical Library).

A COMBINATION OF SULFANILAMIDE AND 9-AMINOACRIDINE AS A SURGICAL ANTISEPTIC

S. DALE SPOTTS, M.D.
PHILADELPHIA, PENNSYLVANIA

ALL wounds are potentially contaminated and may become grossly infected, resulting in great concern to the surgeon and much discomfort to the patient. Wounds seen early should be thoroughly débrided without disturbance of normal tissue and other structures, then treated antiseptically to control possible infections. The surgeon's skill should be supplemented with a reliable and effective antiseptic so that the possibility of wound infection may be reduced to a minimum.

The brilliance of an operation may be impressive but if infection develops and the patient is not cured, the surgeon has failed in his objective. Greater assurance can be given the patient that the results will be favorable provided wound infection can be readily controlled. It cannot be denied that a marvelous technic and the brilliancy of an operation cannot of themselves eliminate the hazard of infections without the aid of an effective antiseptic.

The introduction of sulfonamides seemed to supply an easy and effective method of controlling infection in wounds. Pyogenically infected wounds were first treated by the oral administration of sulfonamides with favorable results in many cases. It was later discovered that topical applications of powdered sulfonamides were more effective. Sulfonamides were accepted with great enthusiasm and their efficacy as therapeutic agents is attested to by the many reports in medical literature.

The topical applications of sulfonamides, powdered or crystals, however, produced several undesirable effects in wounds. The powders in many cases tended to harden in the wounds and produce the effects of a foreign body. The sulfonamides, while effective in controlling infections in a large percentage of cases, apparently delayed wound healing as evidenced by an anemic, grayish, sluggish appearance of the wound.

Veal and Klepser,[1,2,3] whose observations were later confirmed by a number of other investigators[4-8] found that sulfanilamide 10 per cent with allantoin 2 per cent in a non-greasy, water-miscible base* was effective in controlling wound infections and stimulating new healthy granulations, thus eliminating the apparent objectionable features of the powdered sulfonamides.

Spotts and Davis[9] observed that allantoin 2 per cent with sulfanilamide 10 per cent in a non-greasy, water-miscible base controlled infections satisfactorily and at the same time increased cellular growth and vascularization of granulation tissue.

The clinical evidence presented in the various reports on allantoin 2 per cent and sulfanilamide 10 per cent in a non-greasy, water-miscible base indicate that this combination has been found to be effective and reliable in controlling wound infections in a large percentage of cases. We, nevertheless, are living in an age of scientific progress in which effective and reliable chemotherapeutic agents are being made more effective and reliable in their assigned rôles.

ACRIDINES AS ANTISEPTICS

Shortly before and during the first world war, Shiga[10] in Germany, and Browning[11] in England, conducted extensive investigations on the value of the acridines as wound disinfectants.

The most important and better known of the acridine derivatives in the field of chemotherapy are acriflavine and proflavine of the older group and 2–7, diamino-

* Allantomide Ointment was supplied by The National Drug Company, Philadelphia, Pa.

acridien and 5-aminoacridine of the newer group.

Due to the numbering of the acridine units, much confusion exists in the nomenclature of the acridines, as found in the English and the German system. In the English system the 5-aminoacridine is the equivalent of 9-aminoacridine in the German system.

Rubbo, Albert anh Maxwell[12] discovered that the *in vitro* action of 5-aminoacridine is in some respects superior to proflavine and, in addition, found that the substance possesses the desirable feature of being non-staining and non-irritating. They suggested that thorough clinical trails were definitely indicated.

That 5-aminoacridine and its corresponding salts were potential chemotherapeutic agents in wound dressings, was reported by Brownlee and Tonkins.[13]

Perhaps one of the most extensive reports on 5-aminoacridine as a chemotherapeutic drug in anaerobic infection of wounds is that of McIntosh and Selbie.[14] These investigators recommend ointments and mixtures of sulfathiazole and acridine antiseptic. They found 100 parts of the sulfa drug to one part of the acridine antiseptic was most effective.

Editorially, in the British Medical Journal,[15] it is stated that the reason for past failures with the flavines was due to "wrong choice of compounds and misapplications. It (proflavine) should certainly be given further trial in combination with other agents for the prevention and treatment of wound infections." Shortly following this suggestion, the J. A. M. A.[16] commented editorially that "it is desirable to investigate further the possibility of the acridine compounds and particularly proflavine."

The colorless flavine, 5-aminoacridine, when used in a 1 per cent solution, in equal parts of spirits and water, as a skin sterilizing agent approximately six hours preoperatively, according to Bonney and Allen,[17] gave very effective results. Their final conclusion is that the solution they describe, "if used in the manner set forth, efficiently and inoffensively sterilizes the skin."

Poete[18] treated 120 patients prophylactically and curatively with 5-aminoacridine hydrochloride. His results were very good; immediate sepsis control was secured in all but five cases which cleared within a short period. He noted a particularly active effect of the antiseptic against hemolytic staphylococci. In a series of fractures he observed that "it appears to favor bone repair."

It was reported by Goetchius and Lawrence[19] that 9-aminoacridine derivatives exhibit bactericidal effects in high dilutions, particularly against anaerobic organisms.

ALLANTOIN SULFANILAMIDE 9-AMINOACRIDINE OINTMENT

With an apparent synergistic action existing between sulfonamides and 9-aminoacridine, it was decided to incorporate the latter chemotherapeutic agent in the allantoin 2 per cent sulfanilamide 10 per cent combination in a non-greasy, water-miscible ointment to the extent of 1 part in 500, and compare this clinically with the allantoin 2 per cent sulfanilamide 10 per cent in the same type ointment base.

Method of Treatment. One hundred fifty patients were treated with the allantoin 2 per cent, sulfanilamide 10 per cent, 9-aminoacridine 1:500 in a non-greasy, water-miscible ointment base.

The conditions requiring surgical treatment in these patients represented traumatic wounds, postoperative wounds, chronic leg ulcers, decubitus ulcers, second and third degree burns, frostbite and amputation stumps. Practically all such lesions are potentially contaminated or grossly infected. The primary consideration should be for control of the infection and the promotion of the natural process of healing.

Proper preparation of the wound by making its entire surface accessible to the application of the allantoin, sulfanilamide, 9-aminoacridine ointment is the first measure taken in the treatment. It should be

stressed that all necrotic tissue must be removed and all pus pockets and undermined areas drained in order that the ointment may come in contact with all the affected areas of the wound. In the more extensive wound a suitable anesthetic should be used to control pain during the wound preparation.

After the wound has been properly prepared the allantoin, sulfanilamide, 9-aminoacridine ointment is applied in a liberal amount, covered with vaseline gauze over which is placed a dry dressing followed by a light pressure bandage. In a majority of cases dressings were changed at three-day intervals than at five-day intervals until healing was complete. Prior to each new application of the ointment, the wound was cleansed with hydrogen peroxide and sponged dry being careful not to disturb any new granulations.

Record of Observations. The incorporation of the chemotherapeutic agent, 9-aminoacridine, into the allantoin 2 per cent, sulfanilamide 10 per cent ointment apparently enhanced the effectiveness of the latter combination. In many instances, wounds which showed the presence of streptococci and staphylococci were made bacteriologically negative more rapidly with the 9-aminoacridine containing ointments. The time was reduced approximately 30 per cent. In the case of Bacillus coli infections the allantoin, sulfanilamide, 9-aminoacridine was considerably more effective than the allantoin, sulfanilamide ointment.

Used prophylactically the allantoin, sulfanilamide, 9-aminoacridine ointment was effective in all but two patients, both abdominal surgery cases. These developed Bacillus coli infections in the operative wound but were successfully controlled with wet dressings of 9-aminoacridine (1:1000) solution. As soon as the infections were under apparent control, approximately thirty-six hours, the ointment was reapplied and the wound went on to heal successfully.

The infections in the wounds being controlled, vascularization in the granulation tissues and marginal epithelization progressed rapidly. Compared to various other methods of therapy, such as wet dressings, powdered sulfonamides, and several other ointment preparations, healing progressed on an average of 30 per cent more rapidly. The allantoin, sulfanilamide, 9-aminoacridine ointment proved more effective in the presence of blood and exudates than did the ointment without the 9-aminoacridine. At no time during the course of this therapy were systemic reactions, referable to the application of the ointment, observed in these patients. Local reaction was observed in only one patient of the 150 patients treated. This local reaction disappeared when the ointment was discontinued for several days and when the ointment was reapplied no further difficulties were encountered.

COMMENTS

The addition of 9-aminoacridine (1:500) to allantoin 2 per cent, sulfanilamide 10 per cent in a non-greasy, water-miscible base rendered this combination more effective in the treatment of infected wounds and as a prophylactic measure in clean wounds. It was found to be safe, non-staining and soothing; pain was controlled in a majority of cases shortly following the application of the ointment.

Successful and gratifying results were obtained in 150 representing such conditions as traumatic wounds, postoperative wounds, chronic leg ulcers, decubitus ulcers, second and third degree burns, frostbite and amputation stumps.

Sound surgical judgment and good surgical procedures are of great importance, the allantoin, sulfanilamide, 9-aminoacridine ointment being only an adjunct.

The effectiveness of the allantoin 2 per cent, sulfanilamide 10 per cent, 9-aminoacridine (1:500) ointment was evidenced in the rapidity with which wound infections were controlled, the definite vascularization of granulation tissues and the stimulation of marginal epithelization.

REFERENCES

1. Veal, J. Ross and Klepser, Roy G. The treatment of pyogenically infected wounds by the topical application of powdered sulfanilamide and sulfanilamide-allantoin ointment. *M. Ann. District of Columbia*, 10: 61, 1941.
2. Veal, J. Ross and Klepser, Roy G. Local sulfanilamide therapy in surgical infections. *Surgery*, 10: 974, 1941.
3. Veal, J. Ross, Klepser, Roy G. and De Vito, M. P. The preparation of superficial wounds for skin grafting by the local use of sulfanilamide and sulfanilamide-allantoin ointment. *Am. J. Surg.*, 54: 716, 1941.
4. Marshall, W. and Greenfield, E. Modified nonadherent gauze pressure treatment of burns. *Am. J. Surg.*, 63: 324, 1944.
5. Lee, W. Y. Chemotherapy in frostbite. *Am. J. Surg.*, 68: 113, 1945.
6. King, W. E. The management of severe burns. *West Virginia M. J.*, 44: 83, 1944.
7. Niedelman, M. L. and Horoschak, S. Allantoin-sulfanilamide sulfathiazole ointment in pustular dermatoses. *Urol. & Cutan. Rev.*, 67: 172, 1944.
8. Scanlan, L. F. and Gagliardi, J. M. Chemotherapy in traumatic wounds. *M. Rec.*, 158: 27, 1945.
9. Spotts, S. Dale and Davis, J. B. Allantoin-sulfanilamide ointment in surgery. *Am. J. Surg.*, 69: 4–8, 1945.
10. Shiga, K. The growth of bacteria in dyes. *J. Immunol.*, 18: 65, 1913.
11. Browning, C. H. et al. Flavines and brilliant green. *Brit. M. J.*, 1: 73, 1917.
12. Rubbo, S. D., Albert, A. and Maxwell, M. The influence of chemical constitution of antiseptic activity. 1. A study of the mono-aminoacridines. *Brit. J. Exper. Path.*, 2: 69, 1943.
13. Brownlee, G. and Tonkin, I. M. Acridine powder in wound therapy. *Quart. J. Pharm. & Pharmacol.*, 16: 73, 1943.
14. McIntosh, J. and Selbie, F. R. Chemotherapeutic drugs in anaerobic infections of wounds. *Lancet*, 1: 793, 1943.
15. Editorial. Rehabilitation of the flavines. *Brit. M. J.*, 1: 355, 1943.
16. Editorial. Aminoacridine compounds as surface antiseptics. *J. A. M. A.*, 122: 177, 1943.
17. Bonney, V. and Allen, H. S. Sterilization of the skin by colorless flavine (5-aminoacridine). *Brit M. J.*, 2: 210, 1944.
18. Poate, Hugh H. G. Acridine in septic wounds. Use of 5-aminoacridine. *Lancet*, 2: 238, 1944.
19. Goetchius, G. R. and Lawrence, C. A. The antibacterial effect of several acridine compounds. *J. Lab. & Clin. Med.*, 29: 1,177, 1944.

PREVENTION OF ADHESIONS IN THE RIGHT COLONIC GUTTER FOLLOWING RIGHT COLONIC RESECTIONS

CARL Y. WERELIUS, M.D.
BALTIMORE, MARYLAND

THOMAS E. Jones[1] in an interesting article on colonic resections states; "One of the greatest difficulties in resections of the right colon, particularly in the very obese patient, is peritonealization of the right gutter. Improperly completed it will lead to adhesion and obstruction which is a definite factor in mortality. For several years we have obviated this by the use of a modified Mikulicz pack. It prevents the small intestine from becoming adherent and the post operative convalescence is therefore much smoother."

The simple method described below offers no difficulties whatsoever and is to be preferred, in that it eliminates the bad features of an open packed wound with its discomforts, delayed convalescence and infective and herniating potentialities. Recently, in removing a carcinoma of the cecum and ascending colon it was found impossible to peritonealize an area just

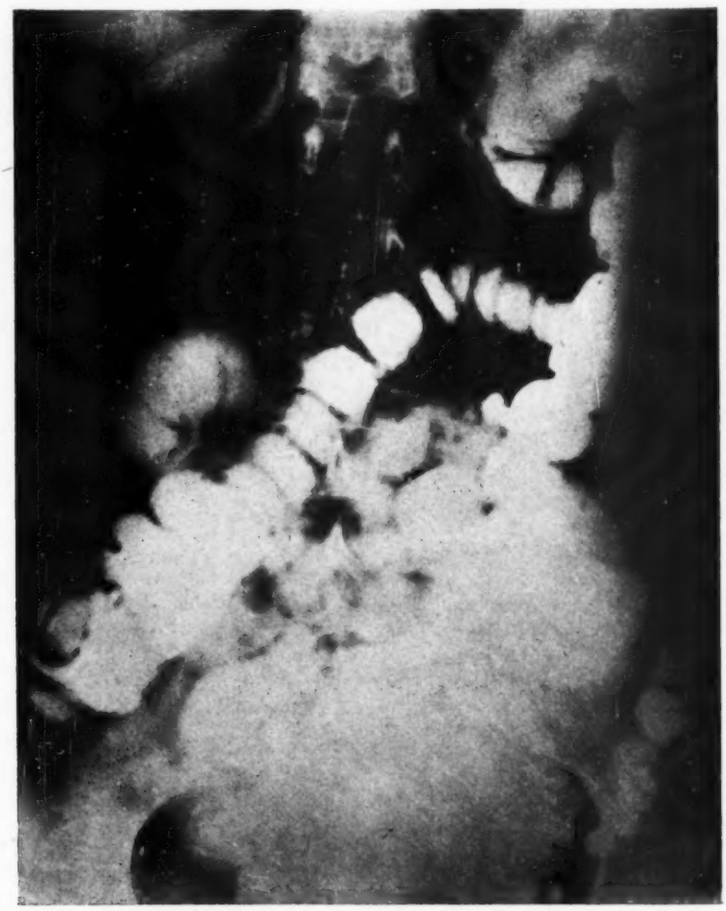


FIG. 1. Proximal end of the transverse colon brought down to cover the raw surface.

above the cecum and part of the cecal bed. In order to cover this raw surface, the author simply used the transverse colon which was brought down without the slightest tension and required only 1 chromic catgut stitch to hold it in position. However, for obvious reasons it would be advisable to use several stitches to firmly anchor the bowel. It was also found that the transverse colon could easily be brought over in order to cover the entire gutter, should that have been necessary, as evidenced by the ample slack of the transverse colon shown in the upper right hand corner of the picture. In those patients in whom part of the transverse colon runs parallel to the cecum and ascending colon the transverse colon would practically fall into position over the gutter. On the other hand, should the transverse colon be only slightly festooned and densely adherent the ileum which is the gut threatened to become obstructed can be put in the trench in such a manner as to prevent future obstruction. The author believes, however, that in almost every patient the transverse colon can be utilized to cover the gutter.

CASE REPORT

The operative procedure described above, aimed at the prevention of adhesions, was carried out December 11, 1945, on Mrs. F., aged forty-eight, under spinal anesthesia at the Illinois Central Hospital, Chicago. The patient left the hospital on December 26, 1945, in good condition. Re-examination of the patient on February 15, 1946, revealed an expected substantial increase in weight, but more interesting and significant in this particular case was the fact that the bowels had moved throughout without any medicinal aid showing that the displacement of the colon had caused no interference with the propulsion of its contents.

Re-examination April 15, 1946, showed a negative abdomen and continued normal bowel movements.

COMMENTS

The open method of end-to-side anastomosis was employed in the above case report, and we attribute the good primary result as mainly due to the careful preoperative preparation and postoperative care of the patient, having followed the admirable schedule advised and used with such remarkable success by Karl A. Meyer et al.[2]

REFERENCES

1. Jones, T. E. *Surgery*, 14: 342–349, 1943.
2. Meyer, K. A., Sheridan, A. and Kozoll, D. D. *Surg., Gynec. & Obst.*, 81: 507–514, 1945.

USE OF ADRENALIN TO PROLONG SPINAL ANALGESIA*

SYLVAN M. SHANE, D.D.S. AND EDUARDO T. RUIZ, M.D.
BALTIMORE, MARYLAND

IN order to prolong spinal analgesia only two alternatives are available, viz., the concentration of the anesthetic drug may be increased to a certain point, beyond which cord damage is imminent; the other method utilizes the more desirable and practical continuous spinal technic.[1] This paper will present a third method, utilizing relatively small amounts of anesthetic mixed with adrenalin which prolongs analgesia even longer than dangerously high anesthetic concentrations and in many cases obviates the time-consuming detail of the continuous spinal technic. The literature on the use of vasoconstrictors to prolong spinal analgesia was recently reviewed by Prickett, Cullen and Gross who also reported the use of adrenalin with procaine.[2]

The 200 patients herein reported were anesthetized with hyperbaric pontocaine-glucose solutions containing varying amounts of 1:1,000 adrenalin. Adrenalin prolonged sensory analgesia almost double the time for pontocaine-glucose without adrenalin. Sensory analgesia was prolonged with dependability while motor relaxation, although prolonged somewhat, was found to be rather unpredictable as to length of time relaxation would persist. Because of the unpredictability of motor relaxation duration, continuous spinal was used in those patients requiring more than two hours, adding adrenalin to the pontocaine-glucose solution so that intervals between subsequent injections were widely spaced even with extremely small doses. (3 to 6 mg. of pontocaine for upper abdominal surgery, for example.)

Pontocaine solution 1 per cent (20 mg. in 2 cc. ampules) was mixed with glucose, either 5 or 10 per cent, utilizing the following formula: mg. or cc. of pontocaine multiplied by three equals the total volume of diluted solution to enter the subarachnoid space.* For example; 8 mg. or .8 cc. of pontocaine multiplied by three equals 2.4 cc. Glucose 5 or 10 per cent is added to the pontocaine in a syringe until it is diluted to 2.4 cc. If 10 mg. or 1.0 cc. of pontocaine is the dose selected, glucose would be added to this solution until the mixture totaled 3 cc. If 12 mg. or 1.2 cc. is the dose, dilution with glucose would bring the total to 3.6 cc., etc.

For continuous spinal a 10 cc. syringe is used, into which 30 mg. or 3 cc. of pontocaine is aspirated. This is diluted to 9 cc. with glucose solution. (Fig. 1.) For any single spinal injection, regardless of whether 6, 8, 10 or 12 mg. of pontocaine is used, only .2 cc. of 1:1,000 adrenalin is added to the pontocaine-glucose mixture. For continuous spinal .6 cc. of 1:1,000 adrenalin is added to the 9 cc. mixture of pontocaine-glucose.

COMMENTS

The average dose of pontocaine rarely exceeded 10 mg. for an adult and was in many cases below 10 mg. The maximum dose was 12 mg. and this figure was never exceeded. There is a very important reason for not exceeding the maximum of 12 mg. When diluted with glucose according to the aforementioned formula, there need be no apprehension with regard to the height of anesthesia reaching the medulla and producing respiratory paralysis or complete upper intercostal paralysis even when the table is placed and permitted to remain constantly in the Trendelenburg position. The reason is that since the medulla is a

* When using the 2 cc. ampule of 1 per cent pontocaine which contains 20 mg., the number of mg. and cc. are identical when a decimal point is used. For example; 1 mg. = .1 cc., 3 mg. = .3 cc., 10 mg. = 1.0 cc., 12 mg. = 1.2 cc., 20 mg. = 2.0 cc., etc.

* From the Department of Anesthesiology, South Baltimore General Hospital, Baltimore, Md.

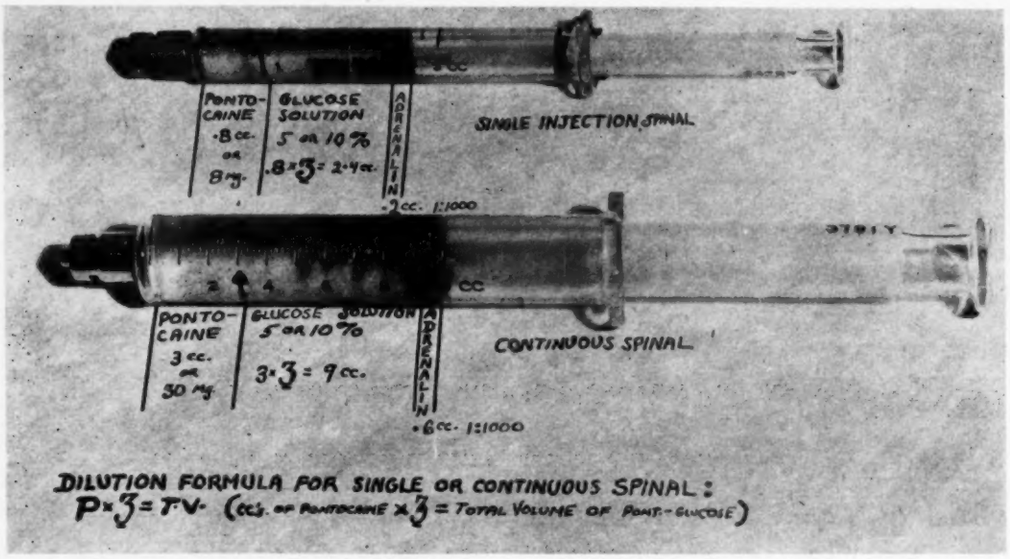


FIG. 1. How pontocaine is diluted with glucose and adrenalin using the dilution factor of 3, which provides the minimum quantity of pontocaine consistent with prolonged motor relaxation.

motor center, by the time the dilute pontocaine-glucose solution reaches this area not only is the pontocaine so diluted in the spinal fluid that it will hardly produce a sensory effect, but motor paralysis is completely obliviated. This is the safety factor in using so dilute a pontocaine-glucose solution as has been described.

Using 10 mg. of pontocaine in glucose *without* adrenalin will produce an average of one and one-half hours of sensory analgesia and from forty-five to sixty minutes of complete motor relaxation. Using 10 mg. of pontocaine in glucose *with* adrenalin will produce an average of three to three and one-half hours of sensory analgesia and from one and one-half to two hours of complete motor relaxation. The addition of more adrenalin, even as much as 1 cc. of 1:1,000, did not prolong analgesia beyond the above stated figures. It would appear that adrenalin exerts its maximum effectiveness in small quantities and will extend the duration of analgesia no further despite increased amounts.

Adrenalin was used with continuous spinal when the initial intrathecal injections were as low as 3 mg. for upper abdominal surgery. This injection had to be repeated, however, about twenty minutes before closure of the peritoneum to assure complete relaxation. When such small doses as 3 mg. are used for upper abdominal surgery, it becomes necessary to use a steep Trendelenburg position during the injection, as well as for a minimum of five minutes after the injection, in order to assure motor paralysis in the upper border of the incision. For upper abdominal surgery in the average good risk adult, an initial injection of 9 mg. is used when employing the continuous spinal method.

There was no noticeable increase in blood pressure which could be attributed to the adrenalin in the subarachnoid space. The physiological explanation for the prolonging action of adrenalin is probably to be found in its vasoconstrictive properties on the mesothelial resorption tubules in the cord and meninges and on the blood vessels in the same area. There were no more instances of post-spinal headache or other neurological sequelae following spinal with adrenalin than that seen when adrenalin was not used. There were no postoperative complications in the entire series. Post-spinal headaches, pulmonary sequelae and urinary retention were not increased beyond what one would expect in a similar series omitting the adrenalin.

For hemorrhoidectomy under spinal, adrenalin was omitted because operating

time was seldom over twenty minutes and there was no indication for prolonging analgesia unnecessarily.

The addition of adrenalin was felt to be a distinct advantage in continuous spinal especially in poorer risk patients where the very minimum dose of pontocaine would be employed. In these patients it was unnecessary to reinject solutions every thirty minutes to an hour. The sensory effect even in small doses was so greatly prolonged that subsequent injections were required for peritoneal closure only.

Other vasoconstrictors (methedrine, neosynephrine and ephedrine) were used with the pontocaine-glucose solutions but none proved as effectual as adrenalin.

CONCLUSION

Spinal analgesia may be safely prolonged by adding small quantities of 1:1,000 adrenalin to intrathecal anesthetic solutions. The prolongation with adrenalin makes it possible to materially reduce the over-all dose of anesthetic drug entering the subarachnoid space. By using adrenalin small, safe doses of anesthetic solution may be made to exert a longer action than larger doses of the same drug without adrenalin. Larger quantities of adrenalin do not increase analgesic duration beyond that caused by small amounts. With continuous spinal the frequency of subsequent injections was lessened when adrenalin was used. Motor paralysis was prolonged but not as extensively as was sensory analgesia. In addition, motor paralysis was not extended for the same length of time in individuals of the same age and physique. For this reason continuous spinal was used in those patients whose operation might extend over two hours in which profound motor relaxation was a prerequisite.

REFERENCES

1. Lemmon, William T. A method of continuous spinal anesthesia. *Ann. Surg.*, 3: 141–144, 1940.
2. Prickett, M. D., Cullen, S. C., Gross, E. G. Spinal analgesia with solutions of procaine and epinephrine. *Anesthesiology*, 6: 469–475, 1945.

OBSERVATIONS ON EARLY POSTOPERATIVE RISING

THOMAS F. KEYES, M.D.
Surgeon, Marysville Clinic
MARYSVILLE CALIFORNIA

THERE has been a trend sweeping the country during the past few years for surgeons to let their surgical patients up from bed early. The author would like to give here his own clinical observations over a five-year period.

During the past five years the writer has allowed the majority of his postoperative surgical patients to rise early, i.e., on the first or second postoperative day. This procedure was actually started by the patients themselves in a county hospital when they got up of their own accord. The author observed that those patients who did so got along much better and had a much smoother postoperative course than those patients who remained in bed during their entire hospital stay.

The author has gotten approximately four hundred major surgical patients up from bed early and has observed that their postoperative course has been much smoother, they have less postoperative complications, they have fewer gas pains, their elimination is better and their recovery is more rapid. In addition, there is no greater incidence of evisceration or hernial development than with those patients who may remain in bed longer. The writer has also gotten patients with hernias up on the first postoperative day and has seen no recurrences which were referrable to their early rising.

There is a great deal said in the literature that patients should be gotten up early only if they have been closed with interrupted cotton or some other non-absorbable suture. For a long time the author believed this but of late he has started getting many patients up (approximately one hundred cases) early on the first and second postoperative days who had been sutured entirely with catgut. (Plain No. 1 for peritoneum, chromic No. 1 for fascia and No. 000 plain for skin.) He has found no greater incidence of wound dehiscence in these cases; on the other hand, he has a case of wound dehiscence in a man seventy years of age with a ruptured ulcer who was debilitated and whose wound was sutured entirely with interrupted cotton sutures. The author believes that wound dehiscence depends to a large extent on the nature and physical condition of the patient at the time of the operation and not on the suture material.

Types of Cases That Rise Early. The following are the types of patients who rise early: (1) Hernias of all kinds as well as appendectomies; (2) cesarean sections have gotten up on the second and third postoperative days; (3) gastrectomies and gallbladders as well as all abdominal surgery; (4) Pelvic operations, supravaginal and vaginal hysterectomies. No patient with complications is gotten up early.

Technic. The author usually suggests to the patient the day before that he is going to get him up the next day and let him think about it for a day. Also he tells him that the sooner he gets up the sooner he will be able to leave the hospital. Those patients who object are not obliged to get up. The next day the author usually gets the patient up himself and employs the following technic: First, he helps him sit on the edge of the bed; then he assists him into a standing position. Then the writer has the patient take a few deep breaths and cough a few times. If there is anything in the tracheobronchial tree it will be coughed up. The patient then is assisted while he takes several steps. The author usually allows the patient to remain up for ten minutes for the first morning and afternoon and gradually increases the time each day.

Benefits of Early Rising. The benefits of early rising are many: (1) Elimination of pain. Almost all surgeons will agree that those patients who do not move around in bed and who splint themselves are the ones who have the most pain. Those who move around a great deal are the ones who will have very little pain; this is especially true of patients who get out of bed early; (2) elimination of gas pains and postoperative ileus. When a patient gets up early he usually belches a few times and gets rid of some gas and from that time on he will have fewer gas pains; (3) a more rapid regain in strength; (4) better function of the bowels and kidneys; (5) less frequency of postoperative embolism; however, one must remember that there are some patients who prior to operation have a quiescent phlebitis of the deep calf veins which may lead to embolism even though one attempts to get patients up early. On the other hand, there is not as much tendency for the development of that type of phlebitis and embolism which occurs in those patients who are kept in bed from seven to fourteen days and have retarded circulation.

As to the fear of some surgeons that there will be more instances of hernia in those patients who get up early, the author would like to state that in his experience he has not seen it occur. There usually are definite causes for postoperative hernia.

SUMMARY

1. Early postoperative rising is of great advantage to the early recovery of the patient.

2. Early rising leads to a lower incidence of embolism.

3. It reduces the number of days in the hospital for those who stress an economic viewpoint.

4. Suture material, in the author's experience, actually does not make any difference in the closure and in getting the patient up, whether cotton or catgut is used.

5. There is no greater incidence of hernia as a result of early rising.

REFERENCES

1. Ashkins. Early rising after surgery. *New England J. Med.*, 233: 33–37, 1945.
2. Spang, A. J. and Spang, J. S. Early ambulation following surgery. *Am. J. Surg.*, 71: 316–327, 1946.

Case Reports

PYLEPHLEBITIS AND PYOGENIC LIVER ABSCESS*

CHARLES J. McGEE, M.D., WALTER S. PRIEST, M.D. AND ARNOLD SCHIMBERG, M.D.
CHICAGO, ILLINOIS

THIS report was prompted by the recovery of a clinically diagnosed patient with pylephlebitis and pyogenic liver abscess who responded to penicillin. Since January 1, 1942, the records of Wesley Memorial Hospital reveal only one other such patient. He too was treated with penicillin. The literature reveals five other patients treated with penicillin.[1–5]

It is not our purpose to discuss liver abscess of amebic origin but only pyogenic liver abscess and pylephlebitis. In this connection it should be remembered that, while pylephlebitis is usually associated with multiple pyogenic abscesses of the liver, pyogenic liver abscess is not necessarily associated with pylephlebitis. The two are separate and distinct pathological entities, "which many have come to regard as synonymous." [6] The diagnosis of both conditions is difficult and may be said to rest on the 'suspiciousness' of the diagnostician. The literature is replete with reviews[5–11] and case reports in an attempt to promote earlier diagnosis. The review of Oschner et al.[7] is particularly complete and concise.

The symptoms of pyogenic liver abscess and/or pylephlebitis are fever, chills, right upper quadrant pain which may radiate to the shoulder, sweating, malaise, severe dull headache, weakness, anorexia, loss of weight, jaundice, dyspnea and the absence of nausea and vomiting.[7–10] All of these symptoms are usually pronounced at some time during the course of the diseases although chronic liver abscess may be puzzling because of the relative mildness of the symptoms.

The signs usually include right upper quadrant tenderness, rigidity, hepatomegaly, splenomegaly, a fixed high diaphragm and an absent gas shadow under the diaphragm in the *x*-ray. Ascites is a rare and late manifestation in the course of either disease.

Diagnostic procedures include peritoneoscopy, aspiration and intravenous thorotrast[1,15] coupled with *x*-ray of the liver and spleen. Each has its limitations and dangers. Leukocytosis above 15,000 is usually present but may be lower in chronic liver abscess. Blood culture is usually negative.

CASE REPORTS

CASE 1. A male, aged forty-six, was admitted to Alexian Brothers' Hospital November 11, 1944, because of continuous fever following a cold two weeks previously. Four days prior to admission he had a severe chill with fever plus pain in the left chest. The presenting complaints were fever, general weakness and aches, headache and anorexia. His general condition was good.

A physical examination revealed the following: temperature 102°F., pulse 84, respirations 18, blood pressure 120/60. There were râles in the left mid-lung fields anteriorly and posteriorly but there were no other abnormal findings. The urinalysis revealed that the specific gravity was 1.020, with a trace of albumin and 20 to 25 leukocytes. The Kahn test was negative. The erythrocyte count was 4,810,000, hemoglobin 92 per cent, leukocyte count 9,200 with 80 per cent polymorphonuclear cells.

Because of clubbing of the fingers, palpable splenomegaly, soft apical systolic murmur, fever and chills, subacute bacterial endocarditis

* From the Departments of Medicine and Surgery, Wesley Memorial Hospital, Chicago, Ill.

was considered the most likely diagnosis in January, 1945. A chill on January 13th, was followed by a temperature of 104°F. and severe abdominal pain. Shortly thereafter a few râles were heard in the right lower and mid-lung fields. The patient complained of insomnia, 50 pounds. Profuse sweating and marked weakness were present. The tongue was atrophic. The chest was barrel-shaped, had a limited expansion and there were dullness and diminution of fremitus and breath sounds in the lower chest bilaterally. A few moist râles were heard

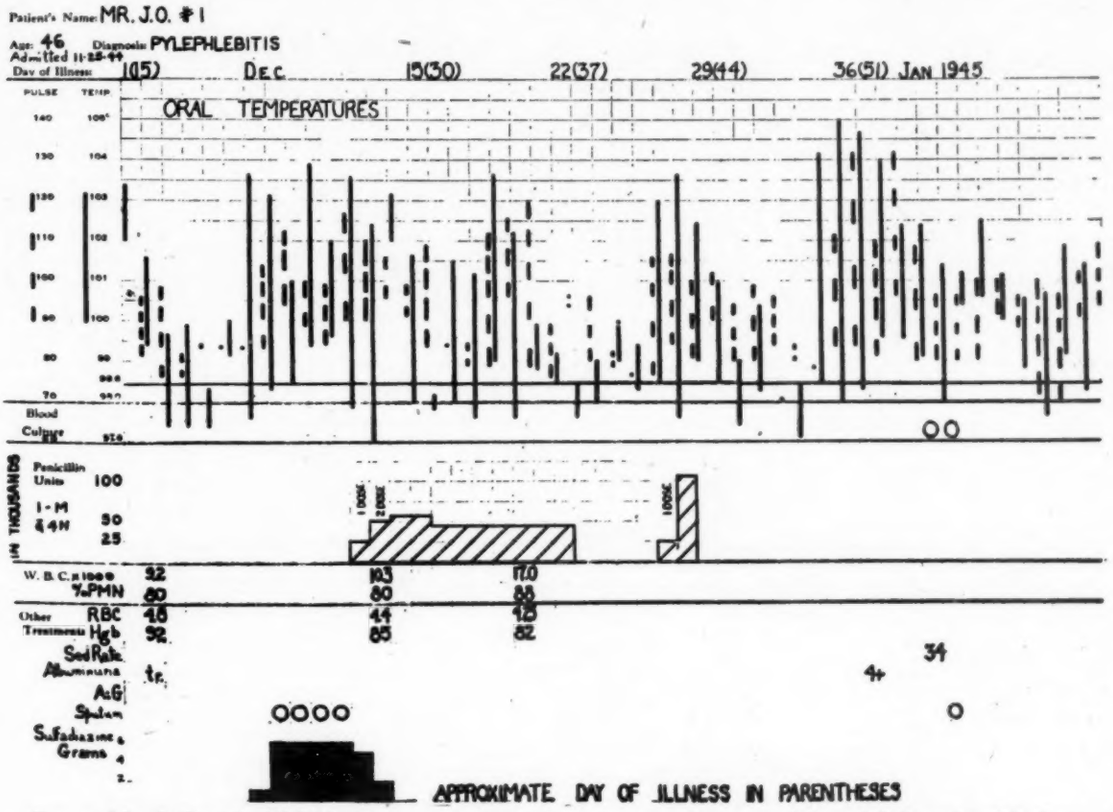


FIG. 1. Mr. J. O. pylephlebitis. For convenience hiatus appears between eighty-eighth and 116th days.

dyspnea and pain in both splenic and right upper quadrant areas. Laboratory studies at that time revealed progressive anemia, sputa negative for tubercle bacilli, normal chest film, negative blood culture, normal albumin-globulin ratio, persistent leukocytosis and albuminuria, negative reactions for the typhoid, paratyphoid, dysentery and brucella groups and a ptosed right kidney with a normal intravenous pyelogram. The sedimentation rate was 34 mm.

He was transferred to Wesley Memorial Hospital on January 20th, at which time he was emaciated, acutely ill, occasionally incoherent and unable to give an adequate history. He appeared about sixty years of age.

His temperature was 99°F., pulse 108, respirations 18 and blood pressure 104/72. It was estimated that he had lost between 30 and in the left mid-lung posteriorly. A faint apical systolic murmur was heard. The abdomen was moderately distended, tympanitic, generally tender and spastic. The spleen was palpable. The liver was felt three fingerbreadths below the costal margin. No embolic phenomena or petechiae were noted.

The urine showed a specific gravity of 1.015, slight trace of albumin and an occasional leukocyte. The erythrocyte count was 2,920,000, hemoglobin 10 Gm. The leukocyte count was 13,350 with 81 per cent polymorphonuclears. The sedimentation rate was 35.5 mm. in forty-five minutes. The icterus index was 18.2 and the blood non-protein nitrogen 23.1 mgm. per cent, CO_2 combining power 40.5 volume per cent, albumin-globulin ratio 3.12:3.48, coagulation time 4.5 minutes (normal being 8 to 10) and the bleeding time was four minutes. The electro-

cardiogram was not diagnostic. The blood culture was negative and the chest film normal.

The following day Wangensteen suction was instituted because of severe abdominal distention. Jaundice appeared two days later. Three to six loose stools occurred daily. Several blood transfusions were administered. He was then given 500,000 units of penicillin per day by continuous intravenous drip from January 24th through February 3rd. The jaundice deepened, the abdomen continued to be distended and painful, the spleen became very hard and on February 5th, the palpable liver surface was described as roughened. Ascites appeared on February 12th, and left pleural effusion February 13th. A barium enema revealed "slight irregularity of the sigmoid region, and further examination of the splenic flexure was recommended because of a very irregular outline suggestive of a lesion of the bowel wall, possibly carcinoma." The gallbladder failed to fill.

Exploratory laparotomy was performed February 19th. The abdomen contained about 300 cc. of turbid yellow, slightly blood-tinged fluid. The spleen was five to six times normal size. The other organs revealed no noteworthy findings.

The diagnosis was still undetermined at the time of discharge from the hospital on March 10th. Eight days later chills occurred accompanied by slight pain in the chest and abdomen. On readmission the next day the pain was still severe. The temperature was 103.8°F., pulse 138 and respirations 32. The abdomen was diffusely tender and rigid, the liver enlarged, ascites moderate and the spleen not palpable. Death occurred on March 26th.

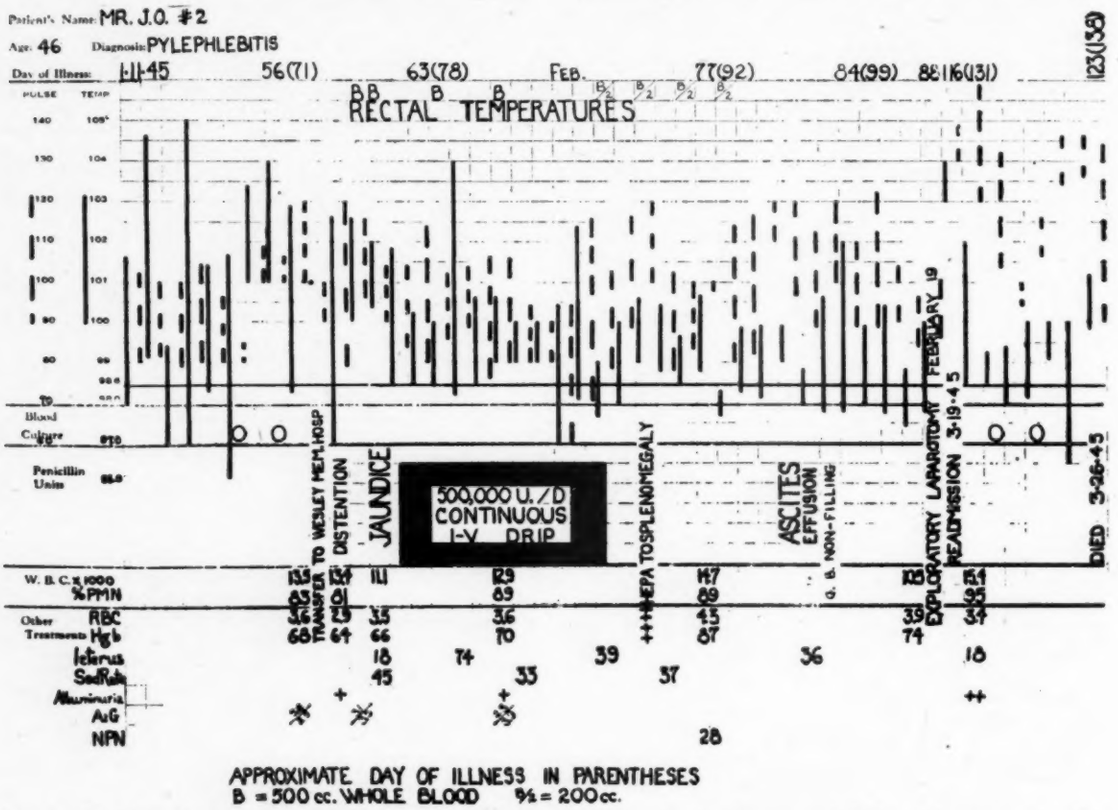


FIG. 2. Continuation of Figure 1. Total penicillin dosage 620,000 units intramuscularly and 5,000,000 units intravenously.

The important autopsy findings were as follows: Subcutaneous fat almost completely absent. The abdomen contained at least 3 liters of moderately cloudy, yellow fibrinous fluid and fibrin deposits were scattered over all the peritoneal surfaces. An area of localized peritonitis extended over the superior and anterior surfaces of the right lobe of the liver, bounded by the diaphragm and the liver, lined with thick fibrin and full of yellowish-green pus; from this area a sinus opened into the liver. The portal vein contained an organizing

thrombus. A moderately thickened gallbladder with almost complete destruction of the mucosa was present. The spleen weighed 440 Gm. and was friable. The pleural cavities were free of fluid and adhesions. The left lung was adherent to the diaphragm.

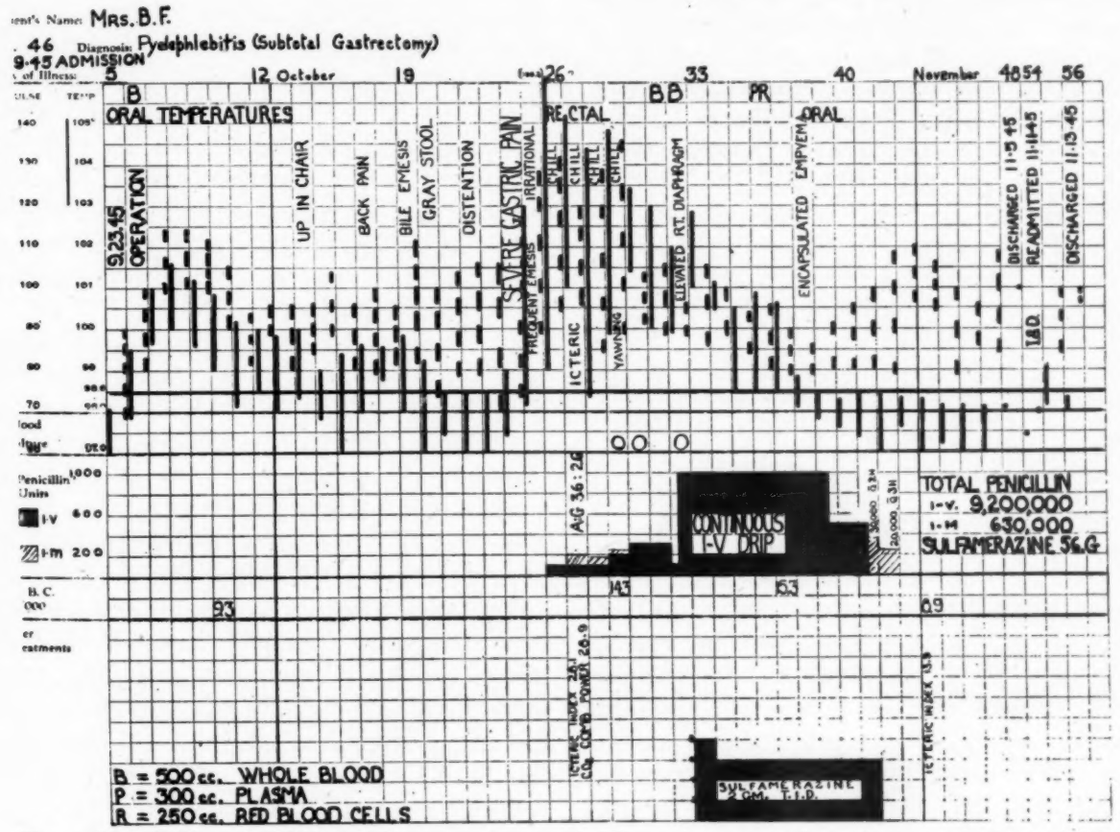


Fig. 3. Mrs. B. F., pylephlebitis (subtotal gastrectomy). The patient was at home between the forty-eighth and fifty-fourth days. Total penicillin dosage was 328,000 units intramuscularly and 6,500,000 units intravenously.

On microscopic section the liver was markedly congested. The stroma of the portal canals was densely fibrotic. Multiple abscesses were present, the fibrotic walls of which were lined by membranes of cellular débris or densely infiltrated with plasma cells or lymphocytes. The wall of the small bowel was fibrosed and the serosa irregularly thickened. Marked fibrosis of the spleen and marked thickening of the capsule were present. In the opinion of the pathologist the liver abscesses apparently resulted from infection of the small bowel. No other specific lesions could be demonstrated. Cultures of the liver abscesses and of the ascitic fluid revealed Escherichia coli.

Case II. Mrs. B. F., aged forty-six, a housewife, was admitted for subtotal gastric resection because of a peptic ulcer. Operation on September 24, 1945, was uneventful as was the immediate postoperative course. On October 5th, she complained of back pain and malaise. Two days later she vomited bile and the next day passed a gray stool. On the nineteenth postoperative day there was severe pain in the hypochondrium as well as abdominal distention. The next day the temperature rose to 103°F. and she was irrational and vomited frequently. During the four succeeding days there were frequent chills and rises in temperature, reaching 106.2°F. rectally. Jaundice developed. On the day following the first temperature rise, 100,000 units of penicillin were given by continuous intravenous drip and the next day this was supplemented by 12,500 units every three hours by intramuscular injection. After two days this was increased to 300,000 units per day by continuous intravenous drip without appreciable effect on the clinical course. Upon increasing the daily penicillin dosage to 1,000,000 units by continuous intravenous drip there

was almost immediate improvement. In six days the temperature was normal but an *x*-ray of the chest showed encapsulated fluid, which had been detected clinically two days previously. Aspiration was not performed. Recovery proceeded rapidly and she was discharged on the forty-second postoperative day. Six days later she returned for incision and drainage of an abscess which had pointed through the abdominal wall in the supra-umbilical region. Cultures of the pus from this abscess failed to show growth under aerobic and anaerobic conditions. She was discharged November 11, 1945. At the time of the last examination, March 1, 1946, she was well, active and performing most of her duties as a housewife, complaining only of slight fatiguability.

Figures 1, 2 and 3 outline the treatment and course. For brevity, hiati appear between the eighty-eighth and one hundred sixteenth days of Case I and the forty-eighth and fifty-fourth days of Case II.

COMMENTS

Prior to this time the mortality rate in liver abscess and/or pylephlebitis has been between 90 per cent and 100 per cent if surgical intervention were not feasible. With surgery the mortality rate has been between 33 per cent and 73 per cent,[12] depending on the route of surgical approach. Complications and multiplicity of abscesses increase the mortality rate.[6,8,12] If abscesses result from cholangitis, drainage can be adequate; otherwise it is not adequate.[9] Parahepatic abscesses are more amenable to surgery with consequent lower mortality rate. The outlook is always grave and prognosis should be guarded.

It is much too early to say what rôle penicillin will play in reducing the mortality rate in these diseases. An insufficient number of patients have been treated. Only five previous case reports were found in the literature. Yater[1] gave his patient only a total of 150,000 units without success. An autopsy was not performed. Sheridan[2] was dealing with a patient with Friedländer's bacillus which is known to be penicillin insensitive. Fish and Conrad[3] were treating a patient with a secondarily infected amebic abscess and used penicillin as an adjuvant to other therapeutic measures. Gonzalez and Vejar[4] used penicillin on a patient with complicated symptoms when all other methods failed. They began with 30,000 units intramuscularly every three hours and gradually decreased the dose and frequency. A total of 2,721,000 units was given over a period of eighteen days. This patient recovered. Flynn[5] gave his subject 20,000 units every three hours for three weeks postoperatively but the patient had surgical drainage for abscess following acute cholangitis and recovered. However, this recovery must be attributed to surgical intervention.

Case I should not be considered as a penicillin failure. The diagnosis was not made antemortem. The causative organism, Escherichia coli, is penicillin-resistant. Unfortunately, in pyogenic liver abscess and pylephlebitis the blood culture is so often negative and aspiration which might help in isolating the offending organism is so dangerous, that it is usually impossible to determine whether or not one is dealing with a penicillin-sensitive organism. Since some strains of Escherichia coli are inhibited by high concentrations of penicillin and since it is difficult to determine the causative organism in these diseases, we believe that large doses of penicillin are indicated in all patients not amenable to surgery.

The massive penicillin dosage which we have employed in subacute bacterial endocarditis[16,17] influenced us in treating Case II. Apparently, a very high blood penicillin level is necessary to inhibit growth of organisms enmeshed in fibrin as is the case in subacute bacterial endocarditis. In order to attain an effective level within an hepatic abscess, equally high or higher blood levels may be necessary. Knowing that a daily dose of 300,000 units is inadequate for the cure of most cases of endocarditis, we advised increasing the daily dose in Case II to 1,000,000 units, because signs and symptoms were still acute although the temperature had started

to fall. We were also attempting to profit by the experience in Case I in which 500,000 units per day for ten days were inadequate. If the Escherichia coli present at autopsy were not a postmortem invader, it is possible that no amount of penicillin would have availed. If, however, the original organism had been something else, then the small doses of penicillin used prior to the 500,000 units might have increased its resistance to the point where the moderately large daily dose of 500,000 units was inadequate.

There may be a question in the diagnosis of Case II. However, in the presence of severe chills and fever, jaundice, extreme morbidity, absence of subdiaphragmatic or subhepatic gas shadow in the *x*-ray and with a negative blood culture we have to doubt that this was a parahepatic abscess. We believe that the abdominal abscess which developed later represents a complication, either a contiguous infection of the subdiaphragmatic space or rupture of a surface liver abscess into this space. It is of great surgical interest to note that the literature fails to reveal reports of such abscesses which, as happened in Case II, found its way between the folds of the ligamentum falciformis and became an abscess necessitans. A simple incision just above the umbilicus, resulting in evacuation of a large amount of sterile material, relieved the patient of all symptoms.

SUMMARY

Two patients with pyogenic liver abscesses and pylephlebitis, one proven by autopsy and the other diagnosed clinically, are presented. One patient recovered after a total dose of 9,830,000 units of penicillin, of which 7,000,000 units were given by continuous intravenous drip at the rate of 1,000,000 units per day. If surgical intervention is not feasible, the use of penicillin in this, or even larger doses, is suggested as a possible life saving measure.

REFERENCES

1. Yater, W. Diagnosis of liver abscess by means of thorotrast hepato-splenography. *J. A. M. A.*, 125: 774, 1944.
2. Sheridan, E. P. Liver abscess, pneumonia and empyema due to Friedländer's bacillus in diabetes mellitus. *New England J. Med.*, 233: 528, 1945.
3. Fish, J. E. and Conrad, H. A. Granulocytopenia complicating sulfadiazine therapy in a severe intestinal injury; report of a case in which penicillin was employed to supplement other therapeutic measures. *Am. J. Surg.*, 70: 109, 1945.
4. Gonzalez, A. A. and Vejar, C. L. Pyogenous hepatitis with staphylococcus bacteremia treated with penicillin. *Gastroenterology*, 3: 33, 1944.
5. Flynn, E. J. Pyogenic liver abscess. *New England J. Med.*, 234: 403, 1946.
6. Eliason, E. L. Pylephlebitis and liver abscess following appendicitis. *Surg., Gynec. & Obst.*, 42: 510, 1926.
7. Ochsner, A., DeBakey, M. and Murray S. Pyogenic abscess of the liver. *Am. J. Surg.*, 40: 292, 1938.
8. Keefer, C. S. Liver abscess. A review of eighty-five cases. *New England J. Med.*, 211: 21, 1934.
9. Williams, H. G. and Owens, J. M. Multiple pyogenic liver abscesses: report of a case due to Bacillus pyocyaneus with recovery. *Am. J. Surg.*, 62: 412, 1943.
10. Eliason, E. L., Brown, R. B. and Anderson, D. P. Pyogenic liver abscess. *Pennsylvania M. J.*, 41: 1,147, 1938.
11. Rothenberg, R. E. and Linder, W. The single pyogenic liver abscess. A study of twenty-four cases. *Surg., Gynec. & Obst.*, 59: 21, 1934.
12. Smith, R. S. Pyogenic liver abscess in the aged. *Am. J. Surg.*, 63: 206, 1944.
13. Alders, N. Portal pyemia with recovery. *Lancet*, 1: 151, 1944.
14. Ottenberg, R. and Berck, M. Sulfanilamide therapy for suppurative pylephlebitis and liver abscess. *J. A. M. A.*, 111: 1,375, 1938.
15. Yater, W. M. and Col, F. O. Ten years' experience with thorotrast hepatosplenography. *Ann. Int. Med.*, 18: 350, 1943.
16. Priest, W. S. Penicillin therapy. *Am. J. Surg.*, 47: 280, 1945.
17. Priest, W. S., Smith, J. and McGee, C. J. Penicillin therapy of subacute bacterial endocarditis. *Arch. Int. Med.*, 79: 333, 1947.

TREATMENT OF CHRONIC SALPINGITIS WITH BENZYL CINNAMATE ESTER (JACOBSON'S SOLUTION)*

MORRIS I. EISENSTEIN, M.D. AND GEORGE J. BENDO, M.D.
NEW YORK, NEW YORK

THIS preliminary report covers thirty cases of chronic salpingitis in which the patients were treated with benzyl cinnamate ester (Jacobson's solution). As far as is known, this therapy is the first of its type employed in this country. Jacobson's solution is a 4.1 per cent of inter-reaction product of benzyl cinnamate and its decomposed radicals in the form of ethyl cinnamate ester and benzyl alcohol dissolved in olive oil.

This drug was introduced and presented by Jacobson in Paris in 1929[1] in the treatment of chronic inflammatory lesions regardless of their localization and pathogenic agents responsible for these lesions. Jacobson studied the biological properties of benzyl cinnamate. The ability of this preparation to inhibit the development of certain microbic agents, to neutralize the toxins *in vitro*, to produce leukocytosis[2] and to provoke a generalized vasodilatation may suggest hypotheses on its mode of action.

What appears to be certain is the vascular reaction, which Jacobson observed and described, on the corneal opacities provoked experimentally on animals prior to treatment with benzyl cinnamate solution. This vascular reaction is temporary. It is characterized by a dilatation of the existing vessels, by an opening of the blocked vessels and by the appearance of newly formed vessels.[3] Clinically and experimentally, it has been observed that Jacobson's solution advantageously modifies chronic inflammatory lesions (produced by various pathogenic agents) by absorbing necrotic tissues and by activating the cicatrization of ulcers.[1]

In 1929, Jacobson suggested that since benzyl cinnamate ester advantageously lessens the severity of chronic inflammatory lesions, the pain at the site of the lesion might be relieved. The inflamed tissue causes irritation and compression of the nerve endings at the site of the lesion. Therefore, when the inflamed tissues regress under the action of this medication, the pain is diminished and symptoms relieved. Jacobson strongly supported this interpretation by working with chronic salpingitis in which there is, at the same time, both subjective pain and an inflammatory lesion which can be demonstrated by palpation. The good results obtained in this condition with benzyl cinnamate ester were confirmed by Levy-Solal, Jacobson, Delsace and Pariente, who treated chronic salpingitis refractory to previous clinical treatment.[4]

These authors noted that the pain usually disappears after five or six injections. This is particularly observed where the pain is continuous. The lesion itself, which can be studied by palpation, regresses by degrees. At the beginning, the adnexal mass becomes more delineated, due to the surrounding tissue becoming smooth and free from infiltration and compression. The mass is then noted to be of a soft consistency. Part of it is absorbed and the remaining mass replaced by a fibrotic-like tissue. There are also cases in which the masses have completely resolved under treatment with Jacobson's solution.

Method of Treatment. The patient receives a series of twelve intramuscular injections of 1 cc. each daily. A rest period of ten to fifteen days is indicated before repeating this procedure. A total of twelve to thirty-six injections may be given, depending upon the nature and severity of the lesion.

* From the Out-Patient Clinic of the Department of Gynecology, Harlem Hospital, service of Dr. Henry C. Falk.

CASE REPORTS

Case I. No. 41-2520, P. M., aged twenty-six, complained of bilateral abdominal pain accompanied by vaginal discharge on March 20, 1946. Bimanual vaginal examination revealed tenderness and thickening of both adnexal regions. A series of twelve injections of benzyl cinnamate (Jacobson's solution) was given over a period of five weeks, and on April 30, 1946, the patient stated that she had no pain since the eighth injection. Bimanual vaginal examination on this date revealed no adnexal disorder.

Case II. No. 46-7526, C. M., aged twenty-two, on April 1, 1946, stated that she had bilateral abdominal pain which was intermittent for one year, becoming very severe two days previous. Upon examination the right adnexa showed a 4 by 4 cm. mass with marked tenderness; the left adnexa showed only marked tenderness and no masses. A series of twelve injections were given and on April 25, 1946, the patient stated that she had no pain since the fifth injection. An examination proved the right ovary to be palpable, with no tenderness, and a 3 by 2 cm. mass; the left fornix was negative.

Case III. No. 45-4025, E. G., aged twenty-two, was being treated for syphilis. On March 19, 1946, she complained of soreness in the lower abdomen. An examination showed the adnexa to be bilaterally tender and thickened. On April 22, 1946, after a series of twelve injections the patient noted that she was free from pain since the eighth injection. An examination showed the right fornix to be negative, the left fornix revealed a 5 cm. non-tender mass.

Case IV. No. 46-7229, E. M., aged nineteen, on March 26, 1946, complained of bilateral abdominal pain with a moderately thick, white vaginal discharge. Upon examination the adnexa were bilaterally tender; the left salpinx was palpable, thick and tender. On April 25, 1946, after a series of twelve injections examination revealed the right fornix to be normal; the left showed slight fullness but no tenderness.

Case V. No. 45-518, M. O., aged nineteen, on March 25, 1946, complained of lower left abdominal pain after receiving sulfonamide and penicillin therapy for five weeks in the hospital. Upon examination the left adnexa was found to be tender and thickened. On April 22, 1946, after a series of twelve injections, the patient stated that she was free from pain since the third injection and was able to continue housework. On final examination the right fornix was normal; the left fornix showed no tenderness with a 4 cm. mass to the left of the uterus.

Case VI. No. 46-7090, K. P., aged twenty-four, on March 19, 1946, complained of pain in both lower quadrants, which had become progressively worse in the past two weeks accompanied by marked vaginal discharge. Examination showed a large tender mass, right adnexa. After a series of twelve injections, the patient reported that the discharge diminished after the sixth injection, and that she had a general feeling of well being since the fourth injection. A final examination showed the adnexa to be normal and the ovaries palpable.

Case VII. No. 45-14926, J. S., aged twenty-six, on March 22, 1946, complained of lower abdominal pain, cramp-like in nature, with marked vaginal discharge. Right salpingectomy had been performed four months previously. Upon examination the left adnexa proved to have a large tender mass. On April 24, 1946, after the twelve injections were given the patient stated that after the first and fourth injections she had headaches. After the fifth injection pain in the abdomen diminished. After the sixth injection the patient said she was free from pain. Upon final examination the left fornix was shortened, with a 4 by 4 cm. mass in the left cul-de-sac and no tenderness.

Case VIII. No. 46-7227, D. S., aged twenty-six, on March 25, 1946, complained of pain in the lower left quadrant for a period of two years, also a white mucous discharge for the past eight months. An examination revealed ropey tender masses in both fronices. On April 23, 1946, after the twelve injections the patient was free from pain and from vaginal discharge. Final examination showed the right adnexa to be ropey, palpable, with no tenderness; the left adnexa showed no masses and no tenderness.

Case IX. No. 46-7215, H. A., aged twenty-two, on March 25, 1946, complained of pain in the lower left quadrant, with profuse, white, watery discharge. An examination showed the right adnexa to be tender, and the left to be tender with a small mass. On April 22, 1946, after a series of twelve injections, the patient stated that she had been free from pain since the fourth injection. Final examination showed the ovaries palpable and small; no other masses and no tenderness were present.

Case x. No. 46–7260, A. B., aged twenty, on April 1, 1946, complained of lower bilateral abdominal pain with the pain in the left side more severe, also vaginal discharge. Upon examination the right adnexa was found to have a 5cm. mass, the left tender and full. On April 25, 1946, after a series of twelve injections, the patient stated she was free from all pain after the tenth injection. A final examination showed the left fornix to have no tenderness, no palpable disorder and the right fornix to be shortened.

Case xi. No. 44-7058, L. S., aged twenty-six, on March 2, 1946, complained of pain in both lower quadrants. The patient was hospitalized a year ago and was told that surgery was indicated, but refused. An examination showed the adnexa to have bilateral tenderness and a tender mass in the right cul-de-sac. On April 29, 1946, after the series of twelve injections, the patient stated that she felt better since the third injection and is free from all pain at the present. A final examination showed the left fornix to be normal; in the cul-de-sac and right fornix a 4 by 2 cm. mass was present with no tenderness. Treatment was continued.

Case xii. No. 44-6371, E. G., aged twenty-four, on March 22, 1946, complained of bilateral lower abdominal pain. She aborted on December 13, 1945, and was admitted to the hospital in January, 1946. There she was operated upon for an "abscess between uterus and vagina." She had been treated previously with foreign protein for a similar condition. An examination showed bilateral tube-ovarian inflammation. On April 25, 1946, after the sixth injection the patient stated she had been free from pain but did not return for further treatment.

Case xiii. No. 46-3293, H. D., aged twenty, on March 22, 1946, complained of bilateral pain of the lower abdomen. This patient received foreign protein therapy without relief. An examination showed a 6 by 4 cm. mass in the right adnexa and tenderness in the left adnexa. On April 23, 1946, after the third injection the patient stated that she had some relief after the third injection and that she was free from all pain at that time. She did not return for further examination or treatent.

Case xiv. No. 46-1145, H. M., aged twenty-two, on March 26, 1946, complained of having abdominal pain all day and distention at night, present for about a year. An examination showed the left adnexa to have a tender mass. On April 25, 1946, after a series of twelve injections the patient claimed that the pain in the abdomen was not severe since the ninth injection, and that she was free from pain since the eleventh injection. An examination showed the ovary to be tender on the left side. Treatment was continued.

Case xv. No. 45-10301, J. B., aged twenty-one, on March 19, 1946, complained of lower abdominal pain on both sides with the pain on the right side very severe. The pains had become progressively worse for the past three years. An examination showed tenderness in the adnexa with thickening. Tenderness was also found in the equigastrium and descending colon. On April 25, 1946, after a series of twelve injections the patient stated that she had been free from all pain since the eighth injection. An examination showed a tender ovary on the left side. Treatment was continued.

Case xvi. No. 45-14568, A. L., aged twenty-three, on March 26, 1946, complained of having lower abdominal pain for four months. She also stated that she was treated elsewhere without improvement. An examination showed the right adnexa to have a large tender mass. On May 2, 1946, after the series of twelve injections the patient reported feeling better since the ninth injection. An examination showed the right fornix to have a 2 by 3 cm. mass with slight tenderness. The left fornix was shortened with no tenderness. Treatment was continued.

Case xvii. No. 46-7257, O. S., aged twenty-five, on April 1, 1946 the patient complained of bilateral lower abdominal pain, also of pain on urination. For several days the patient also had been running a temperature. Examination showed the right adnexa to be tender and full; the left was tender with a 4 cm. mass. After three injections the patient stated she still had pain and did not return for further treatment.

Case xviii. No. 46-8111, S. S., aged twenty, on March 29, 1946, complained of a sharp and constant pain in the lower abdomen since January, 1945. An examination showed a large tender, fluctuant mass. Surgery was suggested prior to the therapy but the patient refused. On April 29, 1946, after a series of ten injections, the patient stated that the pain was intermittent but felt better after the tenth

injection, and did not return for further treatment.

Case XIX. No. 45-4183, B. M., aged twenty-one, on March 25, 1946, complained of pain in the lower abdomen radiating to the back. An examination showed the right and left adnexa to be palpable and tender. On April 23, 1946, after the sixth injection the patient reported that she was pregnant (?) and did not return for further treatment.

Case XX. No. 46-7119, K. L., aged twenty-three, on March 22, 1946, complained of lower abdominal pain which was more severe on the left side. An examination of the abdomen showed tenderness of both lower quadrants, the cervix was soft and tender. Masses were felt in the right and left adnexal regions. On April 2, 1946, after the patient received six injections, she stated she was free from all pain and did not return for further treatment.

Case XXI. No. 46-3732, F. H., aged nineteen, on April 16, 1946, complained of lower abdominal pain present for two and one-half months. An examination of the right and left adnexa showed them to be tender with ropey masses. On April 18, 1946, after two injections the patient said that she felt better and did not return for treatment.

Case XXII. No. 46-7719, M. G., aged twenty-one, on March 26, 1946, complained of bilateral abdominal pain with vaginal discharge for about one year. An examination showed a ropey mass in the right adnexa. On April 9, 1946, after receiving two injections the patient did not return for further treatment.

Case XXIII. No. 42-27340, F. G., aged thirty-two, on March 26, 1946, complained of intermittent pain in both lower quadrants. The pain had been present for two years since the birth of her last child and had become steadily worse. An examination showed the right adnexa to have a large mass. On April 18, 1946, six injections had been given when the patient complained of pricking sensation after the third injection, but stated that she was free from all pain since the sixth injection. She did not return for further treatment.

Case. XXIV. No. 45-2510, C. S., aged forty-six, on March 14, 1946, complained of pain in the left abdomen since February, 1946. She was hospitalized eight months previously for severe abdominal pain. She also had profuse vaginal discharge. Examination showed both adnexa to be full and tender; there was also tenderness in both lower abdominal quadrants. on March 17, 1946, after three injections the patient said she felt better and did not return for further treatment.

Case XXV. No. 46-7118, M. W., aged nineteen, on March 22, 1946, complained of pain in the lower right side. The pain was constant and at times more severe than others. A vaginal discharge was also present. An examination showed a tender mass in the right adnexa. The left adnexa was negative. On March 26, 1946, after three injections were given the patient stated that she had some relief and did not return for further treatment.

Case XXVI. No. 45-12799, M. F., aged twenty-three, on March 19, 1946, complained of pain in the lower abdomen, which was more severe on the left side. An examination showed the right adnexa to have a 4 cm. tender mass and the left adnexa to be tender. On March 28, 1946, after receiving two injections the patient did not return for further treatment.

Case XXVII. No. 46-2528, C. W., aged nineteen, on March 26, 1946, complained of a lower abdominal pain. The patient had received four injections of aolan and pain still persisted. An examination showed the left adnexa to have a tender mass. After the third injection the patient stated that she felt better and did not return for further treatment.

Case XXVIII. No. 43-6927, V. C., aged thirty-nine, on March 19, 1946, complained of lower left abdominal pain with burning on urination. An examination showed the adnexa to have bilateral tenderness and thickening. The patient received one injection and did not return for treatment.

SUMMARY

The thirty patients treated can be divided into the following categories: (1) Thirteen patients received twelve injections* and stated they were free from pain. Local examination showed partial or total regression of lesions. (2) Two patients continued treatment after twelve injections and stated pain was relieved. Local examination showed partial regression of lesions. (3) Three patients received from one to two injections and did not return

*The materials used in this study were supplied through the courtesy of E. Fougera & Co., Inc.

for further treatment and did not state any change in condition. (4) One patient received two injections and stated no improvement. She did not return. (5) Eleven patients received less than twelve injections, stated they were relieved from pain and did not return.

The authors believe, because of the results obtained a further study is indicated with this safe, painless method of therapy which does not require hospitalization or interruption of daily duties. Continued observations are being conducted and a more comprehensive report will be available.

REFERENCES

1. Jacobson, Jacob. *Bull. et mèm. Soc. mèd. d. bôp. de Paris*, No. 13, Seance du avril 19, 1929.
2. Jacobson, Jacob. These de Paris, 1919.
3. Jacobson, Jacob. *Bull. Soc. d'opb. de Paris*. P. 775, Seance du dècembre 9, 1936.
4. Levy-Solal, Jacobson, Delsace and Pariente. Paris méd., October 25, 1930.

Chronic interstitial salpingitis is characterized by enlargement of the tube, whole walls are thickened and often of gnarled appearance. The fimbriated extremity may be closed and bulbous, or it may be partially patent. Surface adhesions, either light or dense, to surrounding organs are almost always present.

From "Textbook of Gynecology" by Emil Novak (The Williams & Wilkins Company).

MEDIASTINAL TUMOR*

JACOB K. BERMAN, M.D., J. PAXTON POWELL, M.D. AND PHILIP C. HENNESSEE, M.D.
INDIANAPOLIS, INDIANA

MEDIASTINAL tumors and cysts are not uncommon. Since the advent of modern chest surgery increasing numbers of patients are being successfully cared for. The purpose of this paper is to discuss briefly the possible origin of these tumors, the types which may occur, the symptoms and signs that they usually produce, methods of diagnosis and the treatment employed in their eradication. In addition, we are reporting two cases of mediastinal teratoma, one of which is unusual because of its enormous size and the multiplicity of its component tissues.

Heuer states that up to January, 1926, 135 dermoid cysts and teratomas had been reported. He believes their origin to be due to ectodermal displacements or abnormal cells of branchiogenic origin drawn into the chest by the descent of the heart. Many other theories have been advanced to explain the presence of teratomas.

Teratology is a subdivision of embryology that deals with abnormal development and its end products—anomalies. While it is certainly true that not all teratomas are examples of monsters, yet a great proportion probably are. Identical or duplicate twins are really an example of teratoma. They develop from a single egg whereby each member acquires precisely the same chromosomal heritage and hence the same genetic constitution. If they are the same size and completely separate, they form two normal individuals. Identical twins may be a double monster when conjoined and this connection may take place anywhere in the body. If they are joined in the thorax, they are called thoracopagus, sternopagus or xiphopagus. Sometimes they are not the same size and in such instances the larger is known as the autosite, the smaller the parasite. The latter may be almost a completely developed included twin—fetus in fetu—which grades down into the teratomas that contain disorderly assortments of tissues or organs.

Other theories include the idea that there is an arrest of certain blastomeres which subsequently undergo a partial fulfillment of their primitive development potentialities; Cohnheim's theory of cell rests which later for unknown reasons begin to grow, and lastly the unproved concept of parthenogenesis of ovarian eggs.

TYPES OF MEDIASTINAL TUMORS

The mediastinum is a fertile ground for tumors and cysts. This is due to the complexity of its development and its component tissues. The following is a useful, but by no means exhaustive classification of these abnormalities:

A. Neoplasms and hyperplasias of the thyroid and parathyroid glands
B. Neoplasms and hyperplasia of the thymus
C. Neoplasms of nervous tissue:
   (a) Sympathicoblastoma
   (*b*) Hour-glass tumors
   (c) Neurofibroma, neurolemmoma, neuroma gangionlare
D. Connective tissue neoplasms:
   (a) Lipoma
   (b) Fibroma
   (c) Chondroma
   (d) Myxoma
   (e) Xanthoma
   (f) Sarcoma
E. Tracheal and esophageal neoplasms
F. Tumors of lymph nodes:
   (a) Acute inflammations; tuberculosis (cold abscess)

* From the Surgical Service, Indianapolis City Hospital and the Department of Surgery, Indiana University Medical Center.

(b) Lymphoblastomas:
  (1) Hodgkin's disease
  (2) Leukemia
  (3) Lymphosarcoma
(c) Endothelioma
(d) Metastatic carcinoma

G. Cystic tumors:
(a) Epidermoid
(b) Bronchogenic
(c) Gastrogenic
(d) Lymphangiomatous
(e) Venous
(f) Pericardial
(g) Pleural
(h) Mixed (dermoid)
(i) Ecchinococcus
(j) Branchial
(k) Duplication of esophagus
(l) Undetermined

H. Vascular tumors:
(a) Aneurysm of aorta
(b) Aneurysm of heart

I. Tumors of pericardium and heart; pericardial cysts; diverticula of pericardium

SYMPTOMS AND SIGNS

The behavior of teratomas is erratic and variable. They may grow or remain quiescent for years. Most observers believe that they grow as the child grows, and that they cease growing after maturity barring complications which would increase their size such as trauma, infection or malignant change. Malignant degeneration is uncommon. Heuer states that the largest tumor reported was 15 by 11 by 9 cm. (Smith and Stone). Schneider's case was 45 cm. in circumference. In sixty cases of dermoids and teratomas only seven were the latter. The first tumor we are reporting seems to have grown as the child grew. Its size is perhaps one of the largest on record, measuring 20¾ by 20½ by 9 cm. The second was discovered early in life and was therefore relatively small.

The symptoms and signs are due mainly to the increase in mediastinal pressure but also to displacements of organs. The former interferes with the return of blood through the superior vena cava and may cause cyanosis, orthopnea, dilation of the superficial veins of the thorax, pulmonary edema, pleural and pericardial effusions. If the obstruction is above the azygos vein, the symptoms are less severe. If below and if the pressure is great, there may be subcutaneous edema of the head, neck, and upper part of the thorax, headache, vertigo, deafness, epistaxis, tinnitus and even convulsions.

Posterior mediastinal tumors such as ganglioneuromas are apt to interfere with the function of the cervical sympathetics producing Horner's syndrome.

By far the most common symptoms of dermoids and teratomas are the persistent cough with or without hemoptysis and dyspnea, which is especially pronounced on the slightest exertion. There may also be dysphagia or regurgitation, hematemesis and recurrent attacks of asthma or pneumonia. Occasionally a patient with a mediastinal dermoid will cough up hair. This symptom is diagnostic.

The size of the growth usually displaces the lung and heart so that there is absolute flatness on percussion and heart sounds and breath sounds are absent or only faintly heard over the affected side. Sometimes there are no symptoms and the growth is discovered by routine *x*-ray examination as in our second case.

DIAGNOSIS AND TREATMENT

The diagnosis of mediastinal growths is made by the history, physical examination, *x*-ray films made in the anteroposterior, lateral and oblique positions, fluoroscopic studies, bronchography, partial pneumothorax and thoracentesis. Roentgenographic studies are indispensable, not only for diagnosis but for position and behavior fluoroscopically. In general, the roentgenologist will note the following characteristics:

1. *Position.* He will note if in the anterior mediastinum the tumor is usually a dermoid or teratoma; the middle mediastinum, a lymphoblastoma, and the posterior mediastinum a neurofibroma or other nerve tissue growth. Therefore, the position

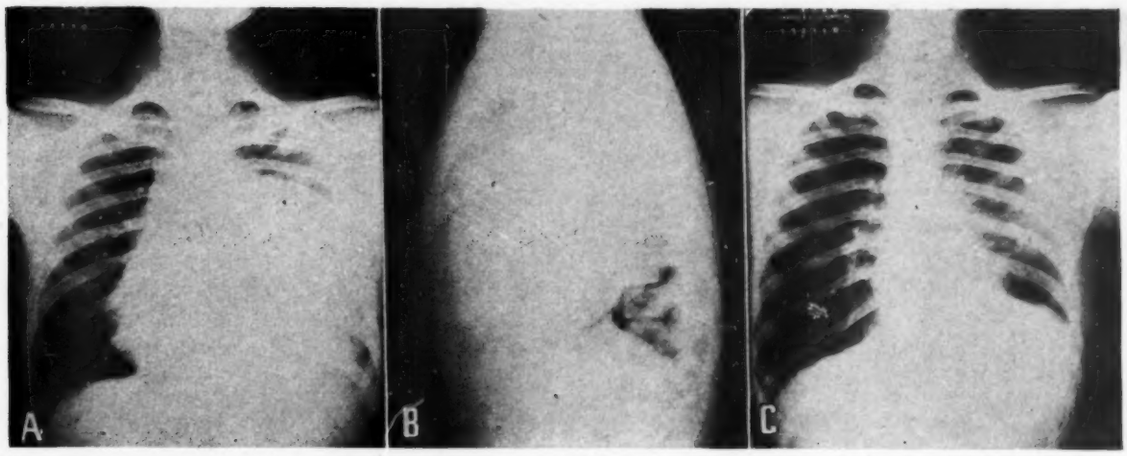


FIG. 1.—Case 1. A, *x*-ray picture of chest prior to operation. Note that almost the entire left chest is occupied by neoplasm; B, lateral view; C, postoperative *x*-ray picture showing re-expansion of left lung.

is a clue to diagnosis. Moreover, it is important in determining the surgical approach. If it is cervical and retrosternal, presenting at the base of the neck, the cervical route or the cervical with division or resection of the superior portion of the sternum is the most direct avenue to the growth. If retrosternal, not extending beyond the mediastinum, access to the growth may be obtained through a trap-door incision, transverse sternotomy, or median and vertical sternotomy which may be superior, inferior, or which may transverse the entire length of the sternum. If the neoplasm is mediastino-thoracic extending into either thoracic cavity or if it is in a lateral thoracic position, a transpleural approach is best. Posterior neoplasms may usually be removed extrapleurally by resecting the overlying ribs; sometimes laminectomy must be done in removing hour-glass tumors.

2. The *presence of shadows* indicating teeth or bone leads to the diagnosis of dermoid or teratoma.

3. The *spine* may show evidence of compression. This with the larger mediastinal shadow is characteristic of an hour-glass tumor.

4. The *mass may pulsate*. This is best observed fluoroscopically or by the roentgenokymograph and if present together with a positive blood test for syphilis, an aneurysm is the most likely diagnosis.

5. The *effect of x-ray treatment* on the size of the mass may help distinguish between different types of lymph node involvement and may also locate the enlargement in the middle rather than the anterior mediastinum, a distinction not always easy. Lymphoblastomas are sensitive to *x*-ray. Leukosarcomas in children regress after roentgen therapy then later emerge with a full-blown leukemia. Benign tumors are not usually radiosensitive.

Bronchography will help in the detection of primary lung neoplasms with mediastinal metastasis and will indicate the site and degree of bronchial compression from mediastinal growths. Partial artificial pneumothorax may help reveal the exact position of the mass, its fixation, density and regularity, especially if studied fluoroscopically. Thoracentesis helps rule out encapsulated empyemas particularly interlobar types. This is especially true now since the use of penicillin locally has become popular. A localized empyema may be sterilized and converted into an inflammatory cyst.

CASE REPORTS

CASE 1. D. A., a fifteen year old white boy was admitted to the Indianapolis City Hospital on October 7, 1945, complaining of persistent cough, pain in the chest and loss of weight. His present illness began three months before his admission with a continual unproductive

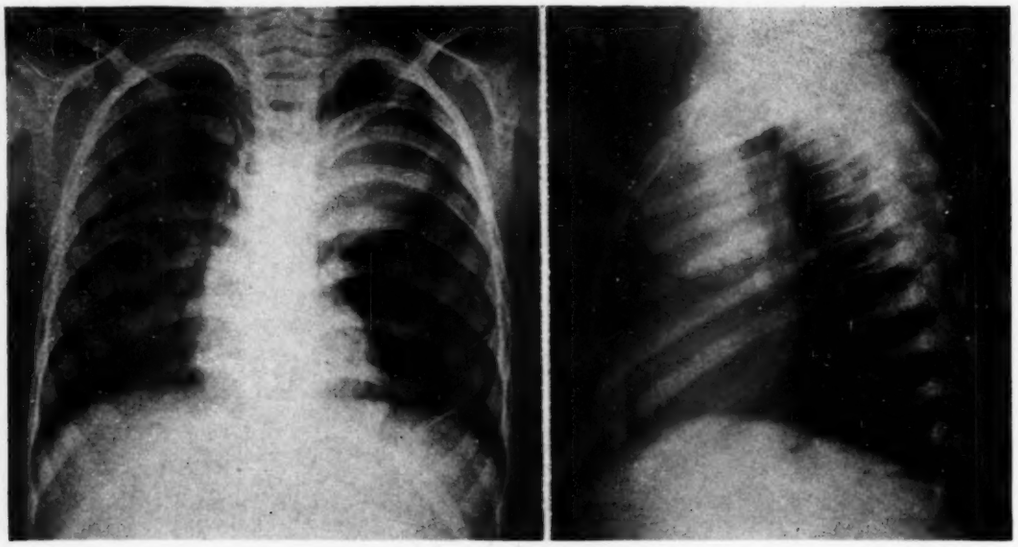


FIG. 2. Case II. Mediastinal tumor. M. C., four years of age. Preoperative *x*-rays of chest showing mediastinal tumor.

cough which persisted throughout the night. He also noticed that the slightest exertion led to exhaustion and severe dyspnea. During this period he had lost 20 pounds in weight. His discomfort was continuous and of a dull aching character which radiated down the left arm and hand. The pain and cough were aggravated upon reclining and was relieved when in the upright position. Therefore, the boy had extremely restless nights. The patient stated that he had no appetite and that his cough caused him to vomit the little food he had eaten. He had never coughed up hair. However, there had been some hemoptysis.

One week before admission to the hospital his family physician had sent him to Sunnyside Tuberculosis Sanitarium where the diagnosis of mediastinal tumor was made.

His family history was irrelevant but his past history was significant. When five years of age he was admitted to the Indianapolis City Hospital because of asthma. At this time *x*-ray examination of the chest showed bronchial exaggeration and some increased density throughout the middle zone of the left lung.

The significant physical findings were an increase in size of the left chest with diminished expansion and enlargement of the superficial veins. There were also flatness on percussion so that the heart could not be outlined, distant normal heart sounds with regular rate and rhythm, absent breath sounds and imperceptible vocal and tactile fremitus.

X-ray examination as interpreted by Dr. A. A. Sullenger, was described as follows: Examination of the chest by fluoroscopy and films taken in the anteroposterior and left lateral projection demonstrated a sharply demarcated tumor apparently arising from the mediastinum and occupying most of the left thoracic cavity. The mass appeared to extend anteriorly leaving a small amount of aerated lung in the apex posteriorly and a small segment of normal lung in the left cardiophrenic angle. The cardiac and mediastinal shadows were shifted markedly to the right. The esophagus was free of any extrinsic pressure but was moved slightly to the right. The tumor appeared to be one single mass. The right lung field was clear.

Laboratory studies showed 14.6 Gm. of hemoglobin; 4,680,000 erythrocytes; 13,650 leukocytes, with 16 per cent lymphocytes, 4 per cent monocytes, 66 per cent neutrophiles, 2 per cent basophiles, 2 per cent metamyelocytes and 10 per cent bands. The Kline and Kahn tests were negative. The urine was normal.

Although the tumor appeared to be in the anterior mediastinum there was no conclusive evidence that the growth was a teratoma or a dermoid, either by the history of coughing up hair or by *x*-ray shadows of teeth or bone. There was still the possibility of lymphoblastic disease. Accordingly *x*-ray treatment was started on November 1, 1945, and was continued for ten days. *X*-ray examination on November 20, 1945, showed no demonstrable change in the size of the mass. The patient

was prepared with sulfadiazine and penicillin for five days prior to surgery and on November 26, 1945, operation was performed under ether anesthesia.

The anesthetic was administered through an intratracheal tube. An incision was made along the course of the fifth rib extending from the posterior axillary line down to the edge of the sternum. The fifth rib was removed subperiosteally and the parietal pleura was opened through the bed of the rib. A large, encapsulated, firm, slightly nodular, tumor was encountered in the anterior mediastinum which measured approximately 23 cm. in diameter. Adhesions between its capsule and pericardium, hilus of the lung and diaphragm were divided by sharp dissection until the growth was entirely free except for its attachment posteriorly and medially. Here two large blood vessels were encountered which were branches of the superior bronchial artery and vein. They were clamped, divided and tied with No. 0 chromic catgut and the growth removed *en masse*. The lung which had been compressed posteriorly and superiorly by the tumor mass was inflated by positive pressure. Topical thrombin was applied locally to oozing surfaces. Then 50,000 units of penicillin in 5 cc. of physiological saline were instilled into the pleural cavity. The pleura and intercostal muscles were approximated with everting horizontal mattress stitches of No. 0 chromic catgut and reinforced with a continuous suture of the same material. The latissimus dorsi and serratus anterior muscles were overlapped, and the skin was closed with interrupted mattress on edge silk sutures.

Dr. William B. Dublin, pathologist, described the excised growth as follows: The specimen measured 20¾ by 20½ by 9 cm. The outer surface was rough in places where dissection was necessary, otherwise smooth indicating the presence of a capsule. There were surface lobules measuring up to 10 cm. in their greatest diameter which were easily separated in places. The color varied from gray through purple to pink. On cross section the tumor was found to be solid in general, although having innumerable minute cystic spaces, most of which were filled with mucin. Trabeculae consisting of cartilage and bone were scattered throughout the mass. On pressure, a yellowish mucoid substance was seen. One portion of the surface appeared to be covered by a relatively dense and tendinous membrane, probably immature skin, and on the surface of this there were a few fine hairs.

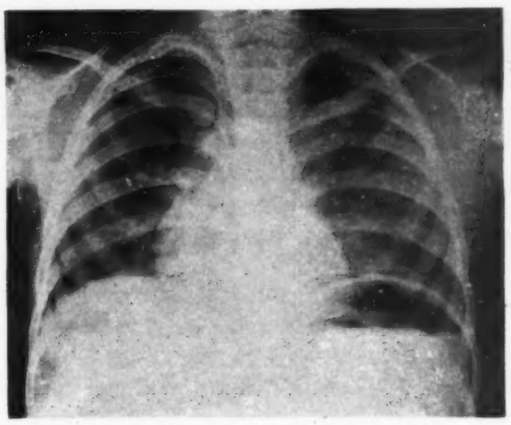


Fig. 3. Case II. Postoperative film taken nine days after operation.

Microscopic examination showed a varied conglomeration of tissues from all three embryonic layers. No anaplastic cells were found, but occasional purulent areas were seen. The following structures and tissues could be identified: bronchial spaces accompanied by smooth muscle, mucous glands, cartilage, bone, connective tissue, tangled bundles of nerve fibers, encapsulated ganglion cells, hypertrophied astrocytes, some squamous epithelium, intestinal mucosa and one section of premature skin with hair.

Diagnosis: Teratoma.

The boy recovered without complications and left the hospital on December 5, 1945, in good condition. He was seen in the out-patient clinic on February 11, 1946, and was entirely relieved of all of his symptoms.

Case II. M. C., a four-year old white girl was admitted to the Indianapolis City Hospital without any complaints. Her parents stated that on the day of admission she had swallowed a watch chain. Part of it she vomited and the parents thought that the rest of it was in the stomach. Routine films of the chest and abdomen were made. A few lengths of the chain were found to be in the small intestine. These were subsequently passed per rectum.

The chest film, however, showed a spherical, well defined density measuring about 6 cm. in diameter arising apparently from the left anterior mediastinum. It was homogeneous and showed no evidence of teeth or calcareous deposits. The heart and lung shadows were normal. *X*-ray interpretation was dermoid cyst.

The child was in perfect health and had absolutely no symptoms of any kind. In an effort to rule out lymphoma, *x*-ray therapy was started and continued for two weeks. A check-up film made after completion of the therapy showed no change in the size of the mediastinal tumor. On September 16, 1946, an anterolateral thoracotomy was done through the bed of the third left rib. A cystic spherical tumor was found measuring approximately 8 by 10 cm. It was attached to the hilus of the left lung and extended into the anterior mediastinum. Its attachment was very vascular. A fairly large artery and vein which were branches of the superior bronchial vessels were tied. Throughout a distance of approximately 1½ cm. the tumor was densely adherent to the pulmonary artery. This was dissected off with great caution but a small injury to the vessel required two lateral sutures. The tumor was completely removed and the mediastinal pleura was not closed. The pleural cavity was irrigated with physiological saline solution. One hundred thousand units of penicillin were left in the pleural cavity and the chest was closed without drainage.

The postoperative course was without complication. Thirty thousand units of penicillin were given intramuscularly every three hours for four days. Thoracentesis was done on the third postoperative day but no air or fluid was obtained. The chest film on the eighth postoperative day showed no abnormalities. The child was allowed to go home on the ninth postoperative day.

Microscopic section of the growth showed a teratoma containing columnar epithelium, muscle tissue, cartilage, nerve and lymphoid tissue.

REFERENCES

Arey, L. B. Developmental Anatomy. 4th ed. Philadelphia, 1942. W. B. Saunders.

Berman, J. K. Non-tuberculous empyema thoracis in children. *Surg., Gynec. & Obst.*, 76: 1943.

Cole and Elman. Textbook of General Surgery. 4th ed. New York, 1944. D. Appleton-Century Co.

Heuer, G. J. and Andrus, Wm. DeW. Lewis Practice of Surgery. Vol. 5, chap. 5, pp. 55–157. Hagerstown, Md., 1945, W. F. Prior Co.

Ladd, W. E. and Scott, H. W., Jr. Duplication or mediastinal cysts of enteric origin. *Surgery*, 16: 815, 1944.

Steele, J. D. and Schmitz, J. A mediastinal cyst of gastric origin. *J. Thoracic Surg.*, 14: 5, 1945.

Sanes, S., Macmanus, J. E. and Scatchard, G. M. Cystic lymphangioma of mediastinum. *J. Thoracic Surg.*, 14: 3, 1945.

MESENTERIC VASCULAR OCCLUSION COMPLICATING THROMBO-ANGIITIS OBLITERANS

EUGENE J. GARVIN, M.D.
Chief Surgeon, Misericordia Hospital
PHILADELPHIA, PENNSYLVANIA

THE purpose of this paper is to give a brief review of mesenteric vascular occlusion, complicating Buerger's disease and to add one more case report to the relatively scant literature on this rare complication. Von Winiwarter, in 1879, used the terms "end-arteritis" and "endophlebitis" in describing the condition of a man fifty-seven years of age, who had obliterative vascular disease of the extremities, but it remained for Leo Buerger, in 1908, to describe the disease accurately, which now bears his name.

Most of the more recent articles on this subject now consider that Buerger's disease is not limited to the vessels of the extremities, but is a generalized vascular disease, occurring in both veins and arteries and often manifest in the cerebral, coronary, pulmonary and mesenteric vessels. Fatherree and Hines state that the conception that thrombo-angiitis obliterans is a generalized vascular disease seems to be gaining ground. The frequency with which extraperipheral vascular lesions occur in individuals with thrombo-angiitis obliterans is strongly in favor of this being a generalized vascular disturbance; however, the lesion considered characteristic of thrombo-angiitis obliterans from an anatomic standpoint has rarely been found in the visceral arteries of persons with the disease, and never, to our knowledge, with an associated degenerative lesion of the arteries. They state that either the more centrally located arteries developed a tendency to arteriosclerotic lesions even though the arteries of the extremities show but little sclerosis or else as an alternative explanation that the same etiologic factor is operating but that the pathologic nature of the vascular lesion varies according to the location in the body of the involved artery.

Meyer also describes a so-called abdominal claudication and states that the condition is entirely medical. Occlusions of small branches of the mesenteric vessels are relatively frequent. They cause symptoms of acute abdominal pain and partial obstruction, which clear up in a short time. Such a history is not infrequently obtained in old arteriosclerotic individuals. When gangrene, however, supervenes, the condition becomes surgical and the mortality is 100 per cent if left alone.

Connors, Averbuck and Silbert have all called attention to the fact that mesenteric occlusion may be due to the same type of disturbance that we find in thrombo-angiitis obliterans.

Incidence. Hausner, of the Mayo Clinic, reviewed the literature in 1940 and was able to find reports of only seven cases of thrombo-angiitis obliterans in which the abdominal vessels were involved. Jaeger reports five cases of thrombotic occlusion of intra-abdominal vessels accompanying Buerger's disease. These vessels were the superior and inferior mesenterics, renal, spermatic and the suprarenal arteries of the abdominal aorta. Dunphy and Whitfield, reviewing thirty cases of mesenteric vascular occlusion, report one case as being due to thrombo-angiitis obliterans. Cohen and Barron reviewed the literature on the abdominal manifestations of thrombo-angiitis obliterans in 1936 and state "investigation of the literature thus discloses only fifteen cases, suggesting involvement by thrombo-angiitis obliterans of blood vessels to the alimentary tract, a remarkably small group of these, only four, are proved, two others doubtfully

proved and the remainder presumptive. There are doubtless encountered clinically hundreds of cases of thrombo-angiitis obliterans of the extremities, in which temporary, fleeting, abdominal upsets occur —probably due to either acute thrombo-angiitis of the vessels or spasm or both." Averbuck and Silbert reported two cases in which the celiac axis was involved, three cases in which mesenteric vessels were involved and three in which the abdominal aorta was involved in a thrombotic process. Ackman, Norpoth and Buerger also have reported instances of mesenteric vascular occlusion accompanying Buerger's disease. Sneierson also reports one case of mesenteric thrombosis complicating Buerger's disease. In his case at autopsy, the mesenteric veins were found to be abnormally dilated with blood clot and the vessels in general showed little pathological disturbance in the area of bowel necrosis. The wall of one medium sized vessel showed marked infiltration with polymorphonuclears.

Diagnosis. The two most constant findings of mesenteric thrombosis are abdominal pain and high leukocyte count. Dunphy and Whitfield state that the particular features to be noted are:

1. Regardless of the duration of the attack, the clinical picture has not been typical of the common surgical emergencies. The localized tenderness of appendicitis, the rigidity of perforated ulcer and the visible peristalsis and early distention of mechanical intestinal obstruction are not present. Usually one is able to make no definite diagnosis. However, the patients always appear ill from an abdominal lesion which simulates, but is not typical of, obstruction.

2. The character of the pain is quite out of proportion to the clinical findings and persists after ordinary measures have been instituted for its relief.

3. The only constant physical finding is deep abdominal tenderness, more or less generalized, with rebound tenderness referred to the point of pressure. In the later stages, the signs of generalized peritonitis develop, but these should not be considered essential in the early diagnosis.

4. The leukocyte count and pulse rate are almost invariably elevated disproportionately to the temperature and other signs. Finally, it is evident that there is a gastrointestinal disturbance, but the manifestations of this are not constant. Difficulty in moving the bowels without complete obstruction, or less commonly, with bouts of diarrhea, is seen in nearly all cases. Vomiting is variable. Bloody diarrhea should not be expected, but when found, it is a valuable contributory sign. Rapidly progressing shock is uncommon and in our experience is more frequently seen in extensive venous occlusion than in arterial occlusion.

Operation. The essential feature at operation is to remove all of the affected bowel and mesentery with enough viable tissue to prevent recurrence or progress of the disorder. Meyer states that recovery has taken place after almost complete removal of the small intestines. Wulsten reports a case of recovery after removal of 360 cm. of small bowel and Sjovall reports a successful resection of 450 cm.

CASE REPORT

Mr. T. G., age thirty-three, was admitted to the Misericordia Hospital on the morning of March 5, 1946. His chief complaint was of upper abdominal pain, distention and vomiting.

The patient claimed that he was well until February 28, 1946, and at this time he was taken with pain in the epigastrium, radiating to both upper quadrants and through to the back. He had vomited off and on at varying intervals since the onset of the attack and had had but one bowel movement and that a loose stool on March 1, 1946. Since the onset of pain, he had been eructating considerable gas and passing relatively normal amounts of flatus.

Mr. G. stated that in 1938, he had suffered with a similar episode of pain which had lasted for four days and he had then secured relief and has had no symptoms referable to his abdomen since that time. For the past eight months he had been under treatment for Buerger's disease; sympathetic paravertebral

block had been done in another hospital five months previously and during the past month, he had been receiving intravenous injections. He denied any previous operations. There was no familial history of Buerger's disease.

A systemic review was essentially negative and there were no symptoms referable to the cardiorespiratory, gastrointestinal or genitourinary systems.

Physical examination revealed the patient to be a young, well nourished male, lying in bed with his hands clasped over the upper abdomen. His temperature was 99°F., pulse rate 80, respirations 20. His head was essentially normal. His pupils were round, equal and reacted sluggishly to light. The conjunctiva was pale and showed a slight amount of icterus. The mucosa of the mouth was normal and the tongue was coated. No adenopathies were present in the neck. The thyroid was not enlarged and the trachea was in the midline. The lungs were normal to inspection, palpation, percussion and auscultation. The heart was not enlarged clinically; tones were good and there were no murmurs.

The abdomen was distended. There was marked tenderness in the upper left quadrant and there appeared to be an irregular mass in this area. Pigmentation of the type frequently seen in peripheral vascular disease was present over both ankles. The pulsations were weaker in the right dorsalis pedis than in the left. There was a small ulcer present above the external malleolus of the left ankle.

Laboratory reports on admission were as follows: Leukocyte count, 15,000.

Urinalysis:

Date 3/5; Color Amber; Sed. Clear; React. Acid; Sp. Gr. 1.027; Album. Trace; Sugar Plus 3; Acetone Trace; Epith. Occas.

Diac., Red blood cells, white blood cells, crystals, casts—negative.

Blood Chemistry:

Sugar, ven	140
Icterus index	22
Amylase	360

Chest examination in the upright posture showed the cardiothoracic ratio normal with no evidence of disease in the lungs or pleura. The diaphragm was smooth and regular on both sides and there was no free air beneath it. A film of the abdomen showed no enlargement of the liver. The kidneys were normal in size and position. There was no evidence of urinary calculus. The lumbosacral spine and pelvis showed nothing abnormal. There was only a small amount and no unusual distribution of gas in the intestinal tract.

Injection of the colon with the barium enema showed no evidence of tumor or any other obstructing lesion. There was what appeared to be a slight smooth pressure effect on the inferior margin of the distal one-half of the transverse colon and possibly also of the descending colon.

A tentative diagnosis of mesenteric vascular occlusion was made and the patient was removed to the operating room.

Under continuous intraspinal anesthesia, the abdomen was opened by an upper left paramedian incision and there was considerable excess of serosanguineous fluid in the peritoneal cavity. Approximately 1½ feet of the proximal ileum, close to the jejunal junction was found to be gangrenous and there was evidence of occlusion in the mesenteric vessels to this portion of the bowel. The bowel was delivered outside of the abdominal cavity and the gangrenous portion was excised through the healthy bowel down to the root of the mesentery. The proximal and distal ends were closed and lateral anastomosis was done; the abdomen was closed in layers without drainage.

The surgical pathologic report was mesenteric thrombosis.

Gross Description: Received in moist gauze was a specimen of a portion of small bowel measuring 41 cm. in length with a portion of attached mesentery. It is reddish purple and tense. In the center there are areas of brownish black mottling. In the center the depth of the excised mesentery is 3 cm. At either end the mucosa is edematous and purplish and as one nears the center it is necrotic and covered with coagulated blood. The mesentery is 1.8 cm. in thickness and hemorrhagic. The terminal blood vessels can be identified. The lumen is filled with both coagulated blood and dark red serum.

Microscopic Examination: Sections taken from either end reveal a mucosa which is still partially viable but which is heavily infiltrated with erythrocytes and inflammatory cells. The subjacent tissue is extremely edematous and there is marked hyperemia of all of the capillary network and dense polymorphonuclear infiltration. The area from the center

shows almost complete necrosis and the mesentery is infiltrated with extravasated erythrocytes, polymorphonuclear leukocytes and fibrin. What appears to be a large vein contains a thrombus. The accompanying artery, which is well preserved, shows no evidence of thrombus formation or inflammatory reaction in its wall.

Diagnosis: Gangrene of ileum, apparently caused by thrombosis of branch of portal vein.

Following operation the patient was placed flat in bed. He was given nothing orally and a Miller Abbott tube was inserted and continuous Wangensteen suction was maintained for the first three postoperative days. One-sixth gr. morphine sulfate was given at four-hour intervals and penicillin, 30,000 units was given intramuscularly every four hours. Nutrition was maintained by intravenous plasma and glucose and the patient was heparinized, after the first twenty-four hours for the following seven days, an attempt being made to keep his coagulation time at fifteen minutes. On the fourth postoperative day, a liquid diet was permitted and the Miller Abbott tube was clamped for one hour after each feeding. On the fifth postoperative day, the tube was kept clamped and a full liquid diet, minus milk, was permitted. Prostigmine, 1:4,000 solution, one ampule every four hours for six doses, was begun on the fifth day after operation. On the seventh postoperative day, the patient was permitted modified soft diet, full soft diet on the eleventh and house diet on the twentieth day after operation.

The leukocyte count gradually returned to normal over the first sixteen postoperative days, although the sedimentation rate remained elevated. His blood urea nitrogen never exceeded 19 and the total serum proteins and A/G ratio approximated the normal. The temperature remained elevated during the first week, the temperature ranging from 99.3°F. to 101.2°F. and the pulse rate between 84 and 136. During the second postoperative week, while his temperature and pulse rate never reached the baseline, they were never exceptionally high. On the fourteenth postoperative day, following a blood transfusion, the temperature rose to 102°F. and the pulse rate to 110. It was believed at the time that this was probably a transfusion reaction, but when they remained elevated over a period of three days, *x*-ray of the chest was done, in spite of the fact that there were no pulmonary symptoms. This examination revealed a homogenous density in the lowermost portion of the left lung area, due either to partial consolidation, atelectasis or pleurisy, associated with a small amount of fluid in the left base. On the eighteenth postoperative day, the temperature reached the baseline while the pulse rate became stabilized at 88. There was one slight elevation in temperature on the twentieth day after operation, up to 100°F. This fell by lysis and remained normal during the remainder of the patient's hospital confinement.

On the twenty-fourth postoperative day, the patient was given barium orally and the small bowel pattern studied. The *x*-ray findings revealed that the stomach was normal in size and position. Its motility and peristalsis were normal. The body of the stomach and duodenal bulb showed no pathological deformity. The entire duodenum and the proximal jejunum were well outlined with the barium and there was definite dilatation in the proximal portion of the jejunum at the site of the anastomosis. However, a considerable amount of barium passed through this area during the first few minutes after the ingestion of the meal. The one-hour film showed the head of the column as far as the distal ileum. Here again very slight dilatation and stasis in the proximal loop of jejunum was seen. There remained only a very small amount of barium in the stomach, indicating increased gastric motility. The three-hour film showed the stomach completely empty and the head of the column already in the region of the splenic flexure. There was retention of only a small amount of barium proximal to the anastomosis. The findings indicated only a slight delay but no obstruction in the region from which a large section of ileum was resected. This slight delay may have been entirely due to edema in the operative site.

The patient was discharged on the twenty-fifth postoperative day, having entirely recovered from the operation.

CONCLUSIONS

This paper presents a report of a case of mesenteric vascular occlusion, complicating Buerger's disease, in which resection was done and the patient recovered. In spite of the fact that the vessels in the

resected portion of bowel did not show microscopically the ordinary vascular lesions seen in thrombo-angiitis obliterans, yet in view of the present literature on this subject, we must consider the mesenteric vascular occlusion as part of the general picture of Buerger's disease. The history also leads one to wonder whether the attack of abdominal pain suffered in 1938, and which he describes as being similar to the pain at this time, may not have been the intermittent claudication so aptly described by Meyer and whether, in this case, the abdominal symptoms did not precede the peripheral vascular symptoms and signs.

REFERENCES

Allen, Edgar V. Thrombo-angiitis obliterans. *Bull. New York Acad. Med.*, 18: 165–189, 1942.

Allen, E. V. and Hausner, Erick. Generalized arterial involvement in thrombo-angiitis obliterans including report of a case of thrombo-angiitis obliterans of a pulmonary artery. *Proc. Staff Meet., Mayo Clin.*, 15: 7–13, 1940.

Averbuck, Samuel H. and Silbert, Samuel. Thrombo-angiitis obliterans, the cause of death. *Arch. Int. Med.*, 54: 436–465, 1934.

Barron, Maurice E. and Cohen, Sidney Slater. Thrombo-angiitis obliterans with special reference to its abdominal manifestations. *New England J. Med.*, 26: 1,275–1,279, 1936.

Blue, John H. and Lafferty, Charles R. Mesenteric vascular occlusions (report of case in which operation was performed). *South. M. J.*, 33: 968–969, 1940.

Boyce, Frederick Fitzherbert and McFetridge, Elizabeth M. Mesenteric vascular occlusion. *Internat. S. Digest*, 20: 67–80, 1935.

Clagett, O. T. and Gray, H. K. Mesenteric vascular occlusion. *Proc. Staff Meet., Mayo Clin.*, 15: 41–43, 1940.

Dunphy, J. Englebert and Whitfield, Robert D. Mesenteric vascular disease. *Am. J. Surg.*, 3: 632–638, 1940.

Fatherree, T. J. and Hines, E. A., Jr. Fatal complications of thrombo-angiitis obliterans; a clinical study. *Proc. Staff Meet., Mayo Clin.*, 13: 342–347, 1938.

Laufman, Harold and Scheinberg, Shayel. Arterial and venous mesenteric occlusion: analysis of forty-four cases. *Am. J. Surg.*, 1: 84–92, 1942.

LeFevre, Fay A. Thrombo-angiitis obliterans. *Cleveland Clin. Quart.*, 9: 104–109, 1942.

Meyer, Joseph L. Mesenteric vascular occlusion. *Ann. Surg.*, 94: 88–96, 1931.

Moore, Thomas. Mesenteric vascular occlusion. *Brit. J. Surg.*, 28: 347–356, 1941.

Pemberton, John deJ. and Whittaker, Lorin D. Mesenteric vascular occlusion. *J. A. M. A.*, 111: 21–24, 1938.

Sneierson, Hyman. Mesenteric vascular occlusion. *Ann. Surg.*, 102: 171–183, 1935.

Taube, Norman. Mesenteric involvement in Buerger's disease (thrombo-angiitis obliterans); report of two cases. *J. A. M. A.*, 96: 1,469–1,472, 1931.

INFECTED BURNS

MAJOR HAROLD CUNNINGHAM SMITH
Medical Corps, Army of the United States
KINGSTON, PENNSYLVANIA

EXTENSIVE body burns present numerous surgical problems because such lesions, aside from embodying the immediate difficulties inherent in severe burns, develop other complications which are due to destruction of tissue and infection. Sequelae of the infection are necrosis and loss of skin, contractures, hemorrhage, anemia, hypoproteinemia and marked systemic reaction.

Hemorrhage subsequent to burns happens infrequently, occurs in only approximately 2 per cent of cases and is more prevalent in badly infected burns, particularly when the slough is dislodged.[1] This is one source of anemia. Most of the anemia in burns, however, results from infection. Hypoproteinemia occurring late in a burn is due, in part, to the loss of small amounts of nitrogen in the urine but more to the loss of larger amounts of nitrogenous materials in the exudate. This hypoproteinemia differs from that which occurs immediately following a burn both in its etiology and in its response to therapy. The syndrome of persistent fever, septic in kind, with frequent chills, elevation of pulse, evident debility and increasing prostration results from the absorption of septic bacterial products. A vicious cycle is thereby established because the anemia and the hypoproteinemia are aggravated by the infection, which in turn becomes more recalcitrant to treatment as the general condition of the patient grows worse. The case report which follows is representative of many late complications of severe burns.

CASE REPORT

A white male, aged twenty-eight, 5 feet 8½ inches tall, weight 145 pounds, sustained a thermal burn March 13, 1943, while cooking over a gasoline stove which exploded. When he saw his clothes afire, he became excited and ran from the site of the accident. Fortunately, he was tackled by a bystander who extinguished the blaze by rolling him over the hard surface of the desert. By then the lower portion of his fatigues, from the tops of his shoes to his hips, had been destroyed. The initial treatment consisted of a débridement in part, the application of sulfonamide ointment dressing and the administration of fluids parenterally.

The ninth day following the injury he was transferred to a General Hospital. On admission he was toxic and acutely ill (temperature 102°F., pulse 124 and respiration 26). The wound emitted a putrefactive odor characteristic of decaying flesh and he was dehydrated and edematous. Blood chemistry and laboratory findings revealed marked hypoproteinemia (plasma proteins 5.2 Gm. per cent), anemia (hemoglobin 70 per cent, red blood cells 3,500,000) and hemoconcentration (hemotocrit 55). The immediate therapy consisted of replacing the protein deficit and correcting the dehydration. As the hemoconcentration was reduced the full extent of the hypoproteinemia became evident, manifesting itself by more extensive edema and a further reduction in the plasma proteins to 4.7 Gm. per cent. So marked was the protein drain that on the third day following admission to the General Hospital, which was twelve days after the injury, 4 units* of plasma were required to restore the plasma protein level to normal. The patient received 6 more units of plasma in the next three days. A diuresis followed, marked by an increase in the daily urinary output from 500 cc. to 3,000 cc. Three days later when the output had returned to normal the edema disappeared. From then until the infection was under control, fluid balance was a constant problem as frequent infusions of blood and plasma were required to replace the continuous protein loss and correct the anemia. (Fig. 1.)

The burned area, estimated at approximately 45 per cent of the total body surface, was made

* A unit of plasma is 250 cc. of dessicated plasma.

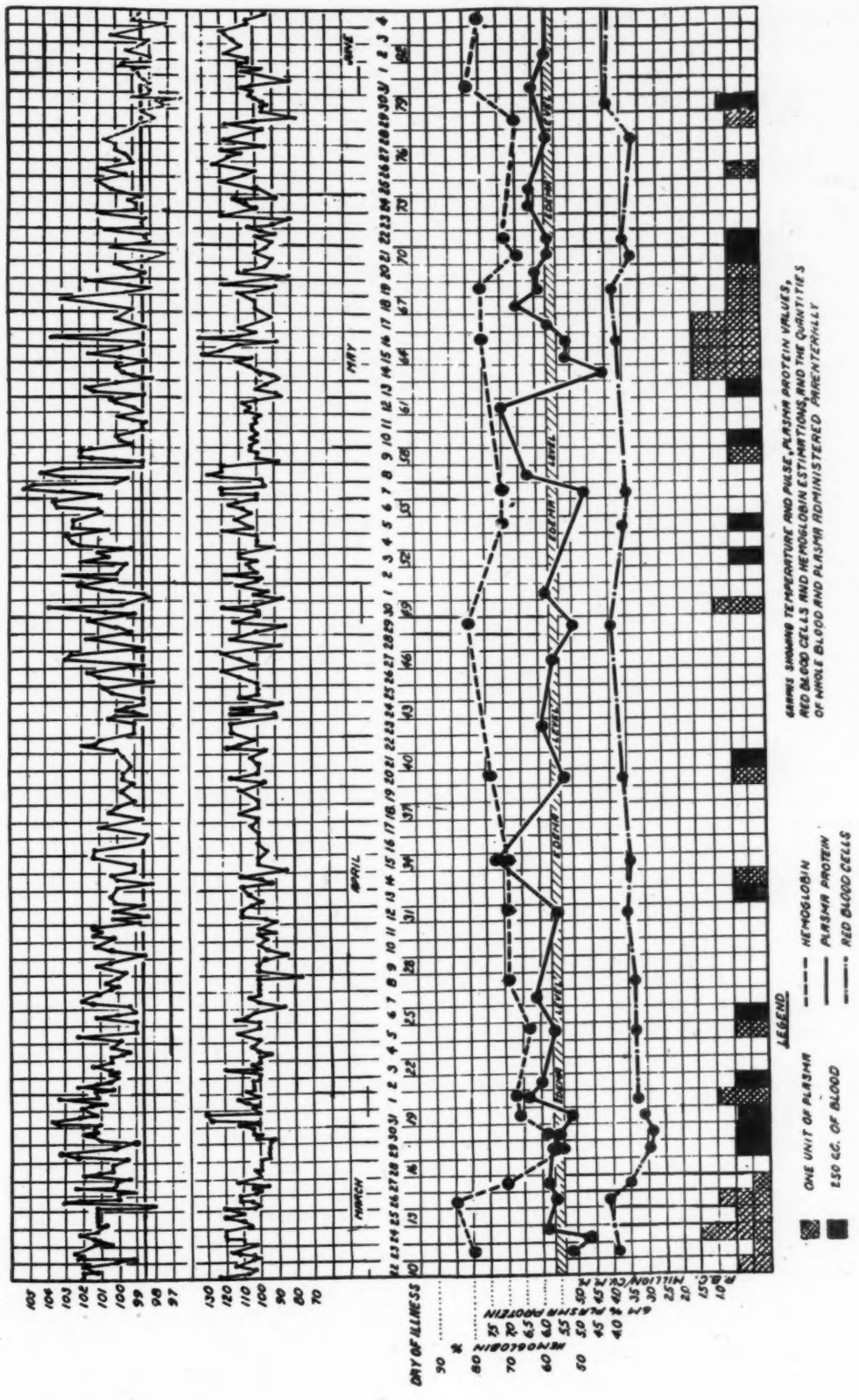

DAY OF ILLNESS
HEMOGLOBIN %
GM % PLASMA PROTEIN
MILLION CU. M.M.
R.B.C.
LEGEND
HEMOGLOBIN
PLASMA PROTEIN
RED BLOOD CELLS
ONE UNIT OF PLASMA
250 CC. OF BLOOD
GRAPHS SHOWING TEMPERATURE AND PULSE, PLASMA PROTEIN VALUES, RED BLOOD CELLS AND HEMOGLOBIN ESTIMATIONS, AND THE QUANTITIES OF WHOLE BLOOD AND PLASMA ADMINISTERED PARENTERALLY
MARCH
APRIL
MAY

FIG. 1.

up of 10 per cent second degree and 35 per cent third degree burns. Both upper and lower extremities, the buttocks and the tip of the penis were involved. The burns on the upper extremities, which surrounded the limbs from the wrists to the mid-portion of the arms, were not deep and healed without complications even though moderately infected. The burns on the lower extremities, with the exception of small areas on the anterior surface of either thigh where the involvement was superficial, were third degree. (Fig. 2.) They extended from the malleoli to the crest of the ilia posteriorly and anteriorly to the upper-third of the thigh. The skin on the legs had been transformed into a parchment-like encasement in which the superficial veins were thrombosed and prominently outlined. The skin on the thighs was grayish-brown in color, devitalized and had a pebbled appearance where sections were distended with small collections of pus. In either popliteal space there was a sizeable pocket of pus. While the hair follicles and sweat glands had been completely destroyed throughout this area, the involvement did not extend beyond the subcuticular tissues and into the fascia or muscles.

The necrotic skin was removed from all that portion of the lower extremities which was deeply burned. This was done in six different stages, under morphine-scopalamine analgesia, starting on the eleventh day following the injury and being completed twelve days later. Sections of devitalized skin with collections of pus beneath them and portions obviously devitalized because of poor attachment to the underlying tissue were removed first. Other areas were excised as they became partly detached. The advantages of this method over that of a complete denudement in one operation under a general anesthesia will be discussed later.

During the course of the débridement, the wound was dressed with sulfanilamide powder and vaseline gauze. The patient was also receiving sulfathiazole by mouth. The drug was readily absorbed from the granulating area, producing a rapid, and perhaps even dangerous but transient, rise in the blood sulfanilamide level. The sulfonamides had to be discontinued because of leukopenia and hematuria; these conditions subsided when the drug was withdrawn. The streptococci were controlled by this therapy as they were no longer cultured from the exudate. The elimination of these organisms, however, had no apparent beneficial effect on the patient's general condition or that of the wound. Sulfonamide therapy was followed by daily immersion baths at a temperature of 100°F., for a half hour, after which the wound was dressed with 33 per cent codliver oil in lanolin. Azochloraminide in triacetin was substituted for the ointment on occasions when an overgrowth of pyocyaneus bacilli was present. Every effort was directed toward the preparation of the granulating area for grafting as soon as possible, and on the forty-first day following injury skin grafting was started.

Small, full thickness, pinch grafts were used, 100 to 150 islands being applied at one time. The popliteal spaces were grafted first and then the contiguous areas. Since immersion baths had to be discontinued at this time, the wound was treated solely with topical applications. Codliver oil ointment, although of definite value in stimulating epithelization in a superficially burned area, had very little if any bacteriostatic action. Within twenty days from the time the grafting was started, the infection on the granulating area became so pronounced that plastic work had to be temporarily discontinued. Drainage from the wound which was profuse showed staphylococci, the predominant organism on culture. The general condition of the patient was becoming worse, a secondary anemia persisted and the plasma proteins remained just above the edema level, even though large and frequent infusions of blood and plasma had been given. The patient's condition was regressing, he was showing the effects of long continued infection and it appeared as though he might succumb to septicemia. Fortunately, insofar as could be ascertained from blood chemical studies, urine examinations and functional tests, there was no evidence of liver or kidney damage.

A concerted effort was then made to replace the protein deficit and maintain the proteins well within the normal limits, instead of just above the edema level as had previously been attempted. The anemia was combated simultaneously. In a period of two weeks, which was fifty-eight to seventy-two days following the injury, the patient received 6,000 cc. of plasma (24 units) and 2,000 cc. of citrated blood. He suffered one moderately severe, delayed reaction from a blood transfusion but with no ill effects. During the same period succynil sulfa-

thiazole was applied locally, 4 Gm. being used with each dressing. A definite improvement in the general condition of the patient and in the wound soon followed. Drainage from the granulating area became minimal and within the next ten days, which constituted an interim of thirty-seven days since the last plastic work had been done, the skin grafting was resumed. Small pinch grafts were used, because of ease of application and greater possibility of survival on an area showing so much infection. Split thickness grafts were preferred but could not be employed for technical reasons. Inasmuch as it was necessary to get the area covered as soon as possible, the most expedient method was used. The entire area was covered in a series of twelve operations. Small ulcers from which microaerophyllic streptococci were cultured formed in several of the grafted areas. These lesions responded to zinc peroxide. When transferred from the hospital to the Zone of Interior, the patient was ambulatory and had good motion of his extremities. Later communications revealed that further plastic work was done; he has since been returned to active duty.

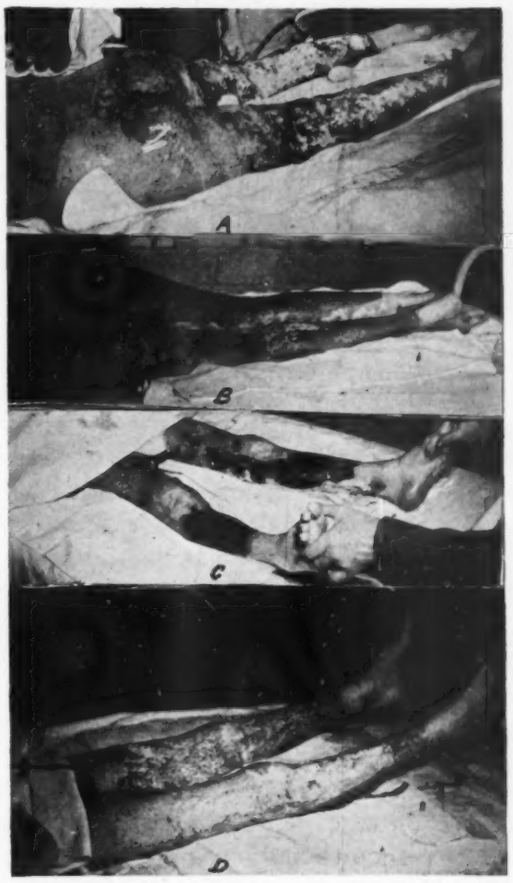


Fig. 2. A and B, burn on the posterior surface of the lower extremities before and after removal of eschar; C and D, burn on anterior surface of lower extremities with eschar partially and completely removed.

COMMENTS

The treatment of deep burns with infection is sub-divided into the problems of denudement, control of infection, maintenance of proper fluid balance, correction of anemia and hypoproteinemia, the prevention of contractures and skin grafting.

Devitalized skin and infected eschars are removed as soon as practicable in order that absorption from infected and necrotic tissue be kept at a minimum. This has been done in one operation under a general anesthetic, but it is ill advised since the process of denuding large areas is attended with dangers from both the anesthetic and the operation. Furthermore, sections of viable skin are frequently sacrificed if the eschar is excised prematurely. This can be proved by making histopathological sections of the tissue removed. Even though absorption from necrotic tissues may be lessened by removing the eschar in one operation, that advantage in no way compensates for the added risk to the patient and the sacrifice of viable skin. An effective way of caring for such areas is to drain all collections of pus as they form and remove the devitalized skin gradually, waiting until its attachment to the underlying tissue loosens before excision.

The amount of tissue destruction produced by a burn is difficult to estimate at the time of injury. Infection of the part further increases the amount of tissue loss; however, the depth to which a burn will penetrate and destroy tissue is generally dependent upon the causative agent and its length of contact. Burns produced by boiling water usually affect only the outer layers of skin; whereas those caused by steam under pressure, other liquids and fats at high temperatures, heated and molten metal and explosions may involve both skin and subcuticular tissues. Chemicals, if

concentrated and not immediately neutralized, will cause marked erosion of tissues. Burns incurred when clothing becomes ignited tend to be deep, particularly if the fire is not immediately extinguished. Electrical burns are often deep and insidious.

Burns become infected from contamination of the skin and clothing of the patient or because of poor surgical technic during the initial treatment or subsequent dressings. Burns treated immediately following injury by gentle cleansing with a minimum of débridement, sterile vaseline gauze and pressure dressings and plasma and blood replacement will harbor fewer organisms than those, which because of extenuating circumstances, cannot be as well attended. Although burned surfaces cannot be rendered and kept sterile, proper early treatment will so reduce the number of pathogens in first and second degree burns that healing will ensue without complications. Deep burns are more prone to become infected because of extensive necrosis of the tissue. Invasive infection causes further destruction of the epithelial cells in the deeper layers of skin.

Meleney[2] states that cultures from burns commonly show mixed infections. This has been confirmed, not only in the case herein presented, but in other infected burns. Organisms usually cultured from the wound are staphylococci, streptococci, Bacilli subtilis, coli, proteus and pyocyaneus and anaerobic and micro-aerophilic organisms. Tetanus and gas bacilli infections are to be prevented in all burns. The source of the invading organisms is evident. Staphylococci are found on the skin and live and grow in sebaceous glands, sweat ducts and hair follicles; streptococci are present in the nose and throat; Bacilli coli, proteus and pyocyaneus are common inhabitants of the gastrointestinal tract; diphtheroids and the Bacillus subtilis are frequently found on the skin, while the source of the micro-aerophilic organisms is uncertain.

Control of the invading organisms is of paramount importance, both because of their devastating action on the wound and also because of their systemic effects. Of primary import is the preparation of the granulating surface for grafting as soon as possible by reducing its bacterial flora. Topical applications and hot compresses may be of some value in helping to clear the local infection, but since the action of the invading organisms frequently extends beyond the local lesion, other therapeutic measures must be used. Some organisms are readily eradicated because they respond to specific drugs, whereas others are more recalcitrant to treatment. Streptococci and other sulfonamide sensitive organisms cause less concern in burns than organisms resistant to sulfa drugs since the former group is controlled by sulfonamides when given by mouth. Staphylococci are frequent and serious invaders of burns; those organisms are more difficult to control but generally respond to penicillin administered systemically and succynil sulfathiazole applied locally.

Although chemotherapeutic agents alone or in combination are definite adjuvants to the treatment of infection, the establishment and maintenance of proper nutrition is most essential. In a burn of this extent, in which 45 per cent of the body was involved, the protein drain generally cannot be compensated for by diet alone, since the patient is usually unable either to ingest or to tolerate the large quantity of proteins needed. Powdered milk, which contains 27 Gm. of protein per 100 Gm., is an effective way of supplying proteins orally. Co Tui et al.[3] kept a patient with a burn involving 50 per cent of the body area in a good state of nutrition with high caloric and nitrogen feedings in the form of dextrimaltose and amigen. They maintain that a mathematical relationship apparently exists between the extent of the burned surface and the amount of nitrogen required to maintain nutrition. The protein drain increases as the infection becomes more marked, as evidenced by the nitrogen loss in the urine and the profuse amount of exudate. The patient herein reported was given blood and plasma as nutritional

adjuvants (Fig. 1), receiving 53 units of plasma (13,250 cc.) and fourteen transfusions (7,000 cc. of blood) while in a General Hospital. This replacement therapy is effectual, although expensive, and not the most efficient way of supplying proteins, as 100 cc. of plasma contains 7 Gm. protein and 100 cc. of blood, 18 Gm. protein. Any anemia should be corrected along with the hypoproteinemia, as anemia supposedly retards the regeneration of plasma proteins. Whipple[4] believes this is due to a priority which the regeneration of hemoglobin appears to have over the available protein.

SUMMARY

1. Complications occurring in severe burns which become infected have been discussed.

2. Salient features of the treatment are: (1) gradual removal of the eschar to avoid unnecessary skin loss and added risk to the patient, (2) control of infection and preparation of the wound for grafting as soon as possible, (3) skin grafting and the prevention of contractures and (4) correction of anemia and maintenance of proper nutrition.

3. The necessity of establishing and maintaining adequate nutrition is again emphasized. If the protein loss cannot be compensated for in the diet, synthetic proteins must be given by mouth, and plasma, serum and blood parenterally as indicated. Any anemia should be corrected along with the hypoproteinemia.

4. A case, representative of a severe burn which became infected, is presented.

REFERENCES

1. Altemeier, W. A. and Carter, B. N. Infected burns with hemorrhage. *Ann. Surg.*, 115: 1,118, 1942.
2. Meleney, F. L. Study of prevention of infection in contaminated accidental wounds, compound fractures, and burns. *Ann. Surg.*, 118: 171, 1943.
3. Co, Tui Wright, A. M., Mulholland, J. H., Barcham, I. and Breed, E. S. The nutritional care of extensive burns. *Ann. Surg.*, 119: 815, 1944.
4. Whipple, G. H. and Madden, S. C. Hemoglobin, plasma protein and cell protein—their interchange and construction in emergencies. *Med.*, 23: 215, 1944.

VILLONODULAR PLASMA CELL SYNOVITIS*

LEO F. BLEYER, M.D. AND K. CARROLL, M.D.
EVANSTON, ILLINOIS

THE term "villonodular synovitis" has first been introduced by Jaffe and co-workers in 1941 to designate pigmented lesions of tumor-like appearance which occur in joints, bursae and tendon sheaths. A brief review of his article[1] shall precede the report of our own case.

FIG. 1. *X*-ray picture of ulnar lesion.

The authors state that in the past, often because of the baffling cytologic picture, many observers have overlooked the basic pathologic process and have named the lesion according to some outstanding gross or microscopic manifestation. Thus among the names applied to this condition are the following: chronic hemorrhagic villous synovitis, giant cell fibrohemangioma, fibrohemosideric sarcoma and polymorphocellular tumor of the synovium. The total number of cases of pigmented villonodular synovitis at the time Jaffe's article was published was fifty-seven including twenty cases of his own study. He stated that the lesion appears always to be monarticular and to have been noted in the joints of the lower extremity, more commonly in the knee. Ages in his series varied between eighteen and forty-eight with a preference of the male sex. The interval between appearance of symptoms and medical consultation varied from one month to five years though the average was two to three years. A history of trauma was elicited from only three of the author's patients. It was found that *x*-ray contributed very little to the diagnosis except to confirm the presence of fluid in the joint or of soft tissue swelling.

The gross appearance of the lesion varied greatly. It was predominantly villous, nodular or represented a combination of the two. In many cases the villi or nodules were fused and the whole joint cavity obliterated by a soft tissue mass. One outstanding characteristic was pigmentation, the color of the lesion varying from reddish-brown to yellow.

Microscopically, the villous lesions showed the villi to be covered by synovial cells in one to three layers. The supporting connective tissue stroma of the villi was loosely textured and composed of polyhedral or spindle-shaped cells. Villi contained a considerable number of thin-walled vascular channels, an occasional one of which was encircled by a cuff of small lymphocyte-like cells. The outstanding histological feature was the presence of brownish pigment granules; in addition, there were hemosiderin-bearing and lipoid-bearing foam cells and multinuclear giant cells. In the more complex lesions presenting a fused or matted villous appearance, the spaces between the villi were reduced to narrow clefts lined by synovial cells.

* From the Pathological Department, St. Francis Hospital, Evanston, Ill.

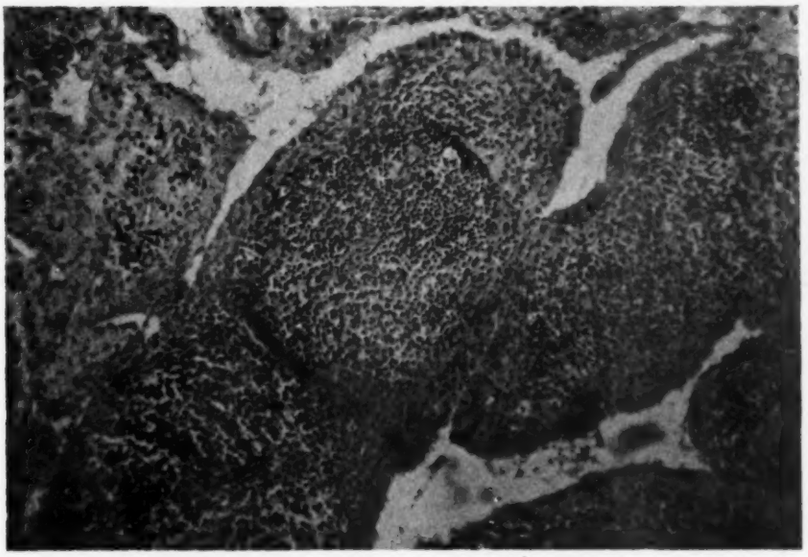


Fig. 2. Low power view of joint contents.

Pulp of the villi consisted of closely packed polyhedral and foam cells with or without pigment. Variable numbers of multinuclear giant cells were also present. The authors emphasize the variability of the microscopic pattern, different areas being dominated by one or another cell type. Marked collagenization and hyalinization of the stroma was seen in the older lesions. The authors reject the idea that the lesions represent a tumor in the true sense of the word, or that it is the result of intra-articular hemorrhage or local lipoid imbalance. They believe that it represents an inflammatory response to some as yet unknown agent.

Although Jaffe's publication presents a very exhaustive study of the subject, we feel justified to report another case of our own observation because of the relative rarity of the lesion among surgical specimens in a general hospital and certain deviations from the description of the lesion by Jaffe.

CASE REPORT

The patient was a forty-five year old white male, and bus driver by occupation. In May, 1945, he stated that he struck the ulnar aspect of his left wrist against the steering wheel of a bus. He had pain in the wrist for two or three days followed by swelling which increased slowly but steadily in size. In July, 1945, he consulted a physician who incised the swelling, telling him that it was a "ganglion." Some clear amber colored fluid was obtained. The wrist and arm were put in a cast for nine weeks. At the end of this time, the swelling was still present although the wound had healed.

In January, 1946, he consulted another doctor who sent him to the hospital. The lesion was described as a firm but not hard mass at the distal end of the left ulna, measuring 1½ cm. in diameter. Except for this finding, physical examination was essentially negative. Laboratory studies were not contributory. *X*-rays of the wrist revealed a circumscribed area of decreased density at the distal end of the left ulna surrounded by a narrow zone of increased density with a fuzzy appearance. There appeared to be some involvement of the lateral side of the radius. Comparison with *x*-rays taken several months earlier showed some increase in the size of the lesion. At operation, February 1, 1946, the joint capsule was thickened and somewhat distended. Upon entering the joint, the synovium was found to be covered by a thick layer of soft, shaggy, grayish-white "granulation tissue." There was a small amount of gelatinous, straw-colored fluid in the joint. The distal end of the ulna was rough and irregular. The distal 3 cm. of the ulna were resected and the granulation tissue clipped away.

The pathological findings were as follows: Grossly, the contents of the ulnar-radial joint

Fig. 3.

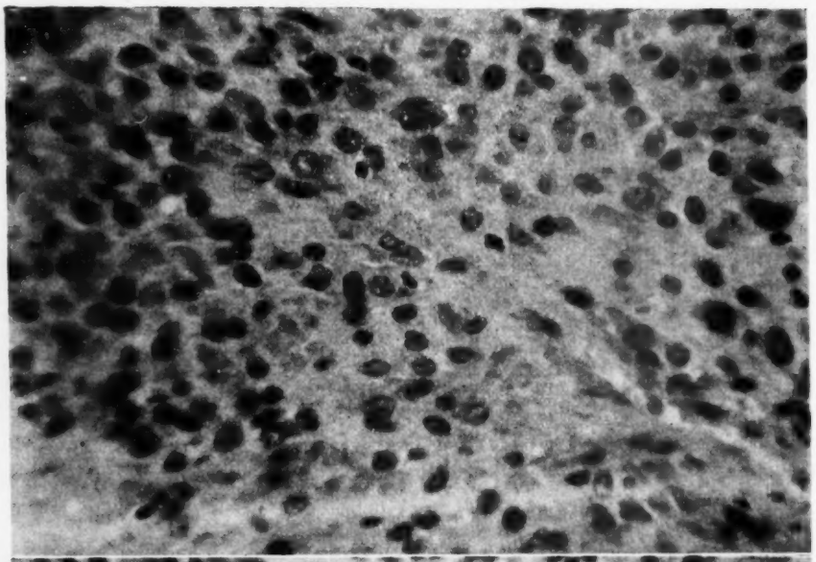


Fig. 4.

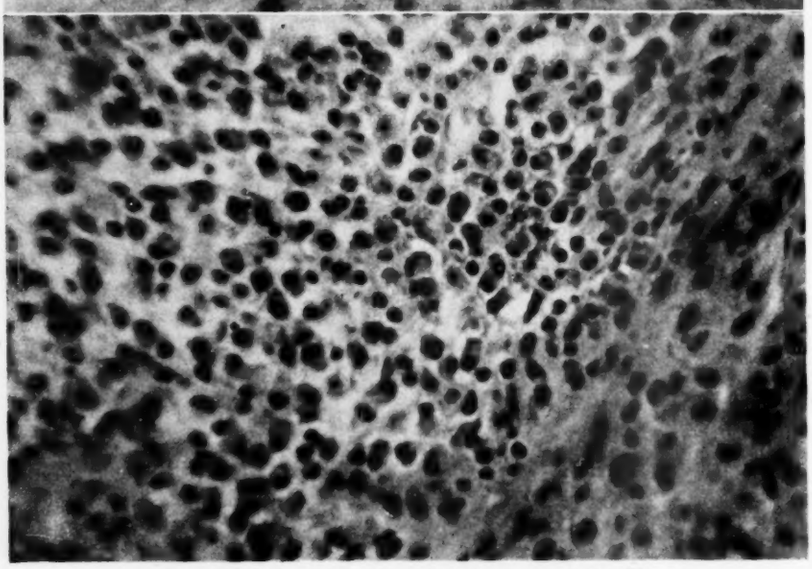


Fig. 3. High power view showing synovial villi.
Fig. 4. High power view showing extensive plasma-cell infiltration of the villi.

resembled granulation tissue and were devoid of any characteristic pigmentation. Contrary to Jaffe's statement that roentgenography is of little value in diagnosis except for confirming the soft tissue swelling, we found in the *x*-ray picture (Fig. 1) a definite ragged corrosion of the distal end of the ulna. The appearance of the resected distal end was in accordance with the *x*-ray shadow.

Microscopic sections (Figs. 2 to 4) were made from both, the bone and the joint contents. The bone sections were completely negative for any penetration of the synovial proliferative tissue. The structure of the joint contents presented villous processes separated by narrow channels and was composed of compact sheets and masses of polygonal and polyhedral synovial cells of fairly uniform size and equal staining power of the nuclei. There was a considerable amount of intervening, partially hyalinized connective tissue. Multinuclear giant cells were present but these were very few in numbers. No pigment of any kind was discernible. Outstanding and partially obscuring the basic cytologic pattern was a heavy infiltration of the villi (Fig. 4) by clusters and collections of plasma cells intermingled with varying numbers of small lymphocytes. Sections were sent for confirmation to Dr. Fred Stewart at the Memorial Hospital in New York City who classified the lesion as villonodular synovitis.

COMMENT

The basic structure of synovial cell sheets in villous and nodular form is the finding by which our case conforms to the description in Jaffe's series. There is, however, a conspicuous absence of pigment the occurrence of which is so much stressed as a typical feature in Jaffe's cases. Even more prominent is the inflammatory plasma cell reaction. We find no mentioning of the latter in Jaffe's report. We are inclined to believe that the post-traumatic inflammatory process was primary and set the synovial proliferation in motion. Although superficially corroding the articular surface of the bone, no deeper penetration could be found.

REFERENCE

1. Jaffe, H. L., Lichtenstein, L. and Sutro, C. J. Pigmented villonodular synovitis, bursitis and tenosynovitis. *Arch. Path.*, 31: 731, 1941.

In cases of purulent arthritis of the ankle-joint there is often a sympathetic effusion into the tendon sheaths. It is possible that suppurative tenosynovitis may be confused with purulent arthritis, but as the former condition is likely to be confined to one set of the synovial tendon sheaths, the differential diagnosis is not usually difficult.

From "Surgery of Modern Warfare" edited by Hamilton Bailey (The Williams & Wilkins Company).

ENTERIC CYST

VICTOR E. TEDESCO, M.D. AND JOHN H. CONNELL, M.D.
Clinical Director and Senior House Surgeon, Huey P. Long Charity Hospital
Pathologist, Huey P. Long Charity Hospital
PINEVILLE, LOUISIANA

CONGENITAL cysts arising from the gastrointestinal tract have been referred to as enterocystoma.[1,2] enterogenous cysts,[3] giant diverticula, ileum duplex inclusion cysts, duplications of the alimentary tract[4] and enteric cysts.[8]

The following case is reported because of the rarity of the condition, the diagnostic difficulty presented and because no previous case of such a size has been reported to our knowledge.

CASE REPORT

A nine year old colored female entered our hospital December 7, 1945, at which time she complained of a swollen abdomen. The child had a noticeable abdominal protuberance since birth. One week before admission she had an episode of vomiting green material that lasted for three days. She noted during this time that she was having pain in the epigastrium which seemed to radiate over the entire abdomen and was accompanied by increased swelling. The family history was non-contributory.

The child was comparatively well until the age of seven, at which time she complained of epigastric pain, abdominal swelling and vomiting. She was admitted to another institution on July 16, 1943. The clinical impression at that time was ascites of undetermined origin, most likely tuberculous peritonitis. The record obtained from the other hospital reported considerable relief following an abdominal paracentesis. A chemical analysis revealed the protein 4.0 Gm. per 100 cc., a negative culture and a smear for acid-fast bacilli and other microorganisms. An *x*-ray of the chest revealed no parenchymal involvement.

At the time she was admitted to our hospital the transfer diagnosis from her local physician was that of Banti's disease. On physical examination the patient was a well developed but emaciated colored child, not acutely ill. Her temperature was 98.6°F., the pulse was 75 and the conjunctiva was extremely pale. The positive findings of the examination were limited to the abdomen which appeared greatly distended and exhibited a fluid wave and shifting dullness. Laboratory findings other than a mild secondary anemia were uninformative.

During the present admission an abdominal paracentesis was attempted on two occasions. On one, no fluid was obtained; on the other, only 100 cc. of cloudy, straw-colored fluid was obtained which contained some fibrous shreads and had a specific gravity of 1.016. On October 11, 1945, the abdomen was opened through a low midline incision where a cystic mass, so large that it displaced all the abdominal viscera, was seen. It was adherent to the parietal peritoneum at the site of previous paracentesis and extended from the brim of the pelvis to the dome of the diaphragm. To facilitate removal the contents of the cyst, which consisted of 3,500 cc. of cloudy, straw-colored fluid, were aspirated. It now became apparent that the cyst had its origin from the antimesenteric border of the small intestine, approximately 3 feet from the ileocecal junction. The wall of the cyst blended with that of the small bowel so intimately that surgical dissection, one from the other, was impossible. The small bowel was divided proximal and distal to the cyst and the entire mass removed. Then an end-to-end anastomosis of the ileum was performed. The patient received supportive treatment postoperatively and the convalescence was uneventful. She was discharged on the thirty-eighth postoperative day completely well.

The pathological report showed the specimen to be a cyst, covered with peritoneum, measuring 30 by 23 cm. The wall was 0.5 cm. in thickness consisting mainly of fibrous tissue. On microscopic examination occasional muscle fibers were discernable. The tumor originated from the wall of the small intestine; the intestinal wall being incorporated with the wall of the cyst. *Diagnosis:* Enteric cyst.

COMMENTS

Several theories have been advanced as mentioned by Ladd and Gross[4] to explain the origin of these cysts: (1) That they are due to a remnant of the omphalomesenteric

duct. While Meckel's diverticulum is the most common form of anomaly due to improper closure of this duct, any remnant of the embryological structure may remain to form such an anomaly; (2) twinning of an isolated portion of an embryo has been thought by some to be the causative factor; (3) cell rests from the primordial intestinal tube which finally obtain all of the histological elements of the wall of the intestine might account for the development of these cysts and (4) Lewis and Thyng[5] advanced the explanation that enteric cysts originate as fetal out-pouchings of the intestinal wall not related to Meckel's diverticulum which normally regresses, but in these cases they pinch off from the intestinal wall and give rise to a duplication. These are frequently found in the fetal alimentary tracts of man, cats, sheep, pigs and rabbits. The out-pouchings are most common in the ileum suggesting a relation of high incidence of such anomalies in the ileum.

Clinically, enteric cysts are a condition of childhood and may occur as duplications of the alimentary tract anywhere from the mouth to the anus. A series of eighteen cases reported by Ladd and Gross[4] vary in ages from two weeks to nine years. Beardsley[1] reported a case where the subject was eight years old. Sawyer[8] reported on two patients, one six years of age and the other eight months old. A few other cases have been reported.[2,3,6,7,8]

The symptoms produced by these lesions are largely symptoms due to pressure of these cysts upon adjacent viscera, thus resulting in obstruction. Patients with cysts occurring at the terminal ileum have even been operated upon for acute appendicitis. In the case reported herein the symptoms were predominately abdominal distention due to the large size of the anomaly, general emaciation from abnormal intestinal physiology and finally intestinal obstruction due to infringement of the cyst on the normal lumen of the intestine.

Consideration of the treatment depends on the location of the cyst and its type of attachment to the alimentary tract. Narrow pedicled cysts may be readily handled by division and transfixion of the pedicle as reported by Beardsley.[1] A broader pedicled cyst, as reported here, presents a more difficult problem. In this case complete excision of the cyst with removal of the attached portion of the intestine was accomplished. This method of treatment has been recommended by Ladd and Gross[4] as the treatment of choice because the wall of the cyst and the intestinal wall blend imperceptibly into each other so that the two cannot be dissected apart. When excision is impossible because of difficulty in mobilization of cyst attachments, marsupialization of the cyst is feasible. If the condition of the patient prohibits resection and primary anastomosis, exteriorization of the cyst with formation of a spur of the attached intestine, as in the Mikulicz procedure, seems to be the most reasonable method of handling the condition.

SUMMARY

1. A case of intestinal anomaly which we prefer to call enteric cyst has been presented.

2. These anomalies are relatively rare, they occur usually in children, they present a definite clinical entity and can be cured with the proper surgical procedure.

REFERENCES

1. Beardsley, J. Murray. Enterocystoma with twisted pedicle. *Am. J. Surg.*, 57: 177, 1942.
2. Ferraro, F. P. Enterocystoma. *Am. J. Surg.*, 57: 525, 1942.
3. Gardner, C. E. and Hart, D. Enterogenous cysts of the duodenum. Report of a case and review of the literature. *J. A. M. A.*, 104: 1,809, 1935.
4. Ladd, William E. and Gross, Robert E. Surgical treatment of duplications of the alimentary tract. *Surg., Gynec. & Obst.*, 70: 295, 1940.
5. Lewis, F. T. and Thyng, F. W. The regular occurrence of intestinal diverticula in embryo of the pig, rabbit and man. *Am. J. Anat.*, 7: 505, 1907.
6. McLanahan, S. and Stone, H. B. Enterogenous cysts. *Surg., Gynec. & Obst.*, 58: 1,027, 1934.
7. Pachman, D. J. Enterogenous intramural cysts of the intestines. *Am. J. Dis. Child.*, 58: 485, 1939.
8. Sawyer, C. F. Enterogenous cysts. *Surg., Gynec. & Obst.*, 70: 78, 1940.

SUCCESSFUL OPERATION FOR IMPERFORATE ANUS AND IMPERFORATE RECTUM

THREE YEAR FOLLOW-UP REPORT

JOSEPH LIBURT, M.D.
Attending Proctologist, Huntington Hospital, Huntington, N. Y.
HUNTINGTON, NEW YORK

ALTHOUGH estimates vary as to the incidence of malformations of the anus and rectum in the newborn, the consensus of opinion among proctologists whose experience has been culled during the past seventy-five years, points to an incidence of about one in every 10,000 births. Even these statistics are not entirely accurate for they refer to gross malformations; malformations of a partial nature which presented no physical symptoms in early life were not included. Many people have gone all through life without ever knowing that any rectal abnormality existed. The incidence of all types of anal and rectal abnormalities would certainly be reported as greater, if a more systematic examination of the rectum in the newborn was performed by the attending physician.

According to Rankin, Bargen and Buie, "ano-rectal anomalies can in most instances be explained on the basis of arrested or irregular development of the embryonic proctodeum and post-allantoic intestine, with or without persistence of the communication with the cloaca."

Yeomans delineates the usual situations found as follows: (1) The epiblast does not invaginate at the canal site and the anal canal is absent; (2) there is a rudimentary or developed anus partly or completely occluded by a persistent anal membrane; (3) the postallantoic undeveloped intestine does not descend and ends blindly without function; (4) the postallantoic intestine descends but grows backward out of alignment with the proctodeum: thus intervening tissues are not absorbed and there is no function; (5) the urorectal partition of the cloaca is arrested, the rectum communicating with the bladder, urethra, vagina or perineum and the anus is usually completely closed with restricted function; (6) the urogenital outlet is in the rectum and (7) there is a persistence of the neurenteric canal with the opening of the postanal intestine in the sacral region.

The case under consideration is that of a newborn infant who had a complete absence of the anus, sphincter, anal canal and rectum.

CASE REPORT

A baby boy F. C., was delivered by cesarean section at Huntington Hospital, Huntington, N. Y., on March 5, 1943, at 9:40 P.M. The baby's weight was 7 pounds, 3½ ounces. Apparently no gross abnormalities were noted at the time of delivery, for the nursery called the attention of the attending physician to the fact that on cleaning and oiling the baby no meconium was seen and on closer inspection no anal opening was found. On the morning of the next day, March 6, 1943, the baby was referred to the author for examination and disposition. An external examination showed merely a dimple at the end of the raphe leading down from the scrotum, with the dimple situated higher up than the usual anal site. There was no discoloration or bulging at the perineum when the baby cried, strained or when the abdomen was pressed.

The baby was operated upon the same day at 4 P.M., without an anesthetic and with the baby placed in the lithotomy position. The dimple was incised first. There was no escape of meconium or gas nor evidence of any anal canal or external sphincter. The incision was then extended posteriorly to the tip of the coccyx. By blunt dissection, using gauze on the index finger and at times a pair of Metzenbaum scissors, the author explored along the coccyx and sacrum, also laterally and anteriorly but was unable to find any evidence of a rectum. Having reached the promontory of the

sacrum, he arrived at the pelvic floor where, by careful blunt dissection and teasing with the Metzenbaum, the sigmoid colon was exposed. The latter was shown as a blind end, distended and discolored and situated at the anterior portion of the floor about 6 cm. proximal to the outside. The author believes that he was extremely fortunate in finding this piece of bowel when one takes into consideration the extent of the anatomy concerned in the field of operation. Briefly, the distance in infants between the tuber ischii is normally 2 cm., that from the scrotum to the coccyx averages 4½ cm., while the distance from the normal site of the anus to the tip of the coccyx measures 1½ cm. These measurements give the reader an idea of what we had to contend with anatomically.

Having exposed the sigmoid colon, the attachments were then freed and by careful teasing the writer was able to bring the sigmoid down to the cut edges at the outside where the anus would be situated normally. After insufflating 30 grains of sulphathiazole powder into the perineal cavity, the bowel was anchored with several No. 0 chromic catgut sutures, followed by an incision of the colon. The result was an escape of a large amount of meconium and gas. The mucus membrane were then sewed to the cut edges of the skin with interrupted No. 0 chromic catgut sutures.

A few pertinent notes of the baby's progress during its stay at the hospital are given here at this time: On March 8th, greenish stools came through the new anal outlet; on March 18th, the incision posterior to the new anal outlet was fairly loose, due to straining at stool. The new anal outlet at the mucocutaneous junction continued to stay in place. There was a mild grip to the anal outlet when a cotton applicator was introduced. The perineal wound was healing well. The baby was discharged from the hospital in good physical condition, weighing 7 pounds, 12 ounces.

The baby was followed up in my office and below are relevant excerpts from my office records: The weight of the baby on May 7, 1943 was 13 pounds. The anal opening admitted a cotton applicator. The anal canal was to be dilated at home by the mother several times daily, using various sized urethral catheters for this purpose. On June 2nd, on stretching the new anal canal, one observed a small amount of bleeding. Stretching with the urethral catheters was found to be succeeding. In November, the weight of the baby was 18 pounds, with fairly good control of the stool. Due to continued stretching of the anal canal, the catheters had been discarded and in their place a set of Wales bougies were used. The canal could be stretched with a No. 14 Wales.

In March, 1945, the baby's weight was 28 pounds, its height 34½ inches. The anal opening admitted the index finger. There was a ring of scar at the anal canal which gripped the finger moderately when one did a digital examination. The mother stated that the baby had two to three movements daily. In September of the same year, the baby averaged one to two movements daily which he controlled very well. with an occasional loss of a small amount of stool. For the past five months the mother had been inserting the bougies at three- to four-day intervals. Examination of the anal canal with the index finger at that time indicated a moderate grip. February, 1946, the weight of the baby was 34½ pounds, with the height 36¾ inches. We found a well developed boy, bright, alert and in good physical condition. There was good scar control in the anal canal. Since the first of the year the mother had discontinued the use of the Wales bougies, finding them unnecessary.

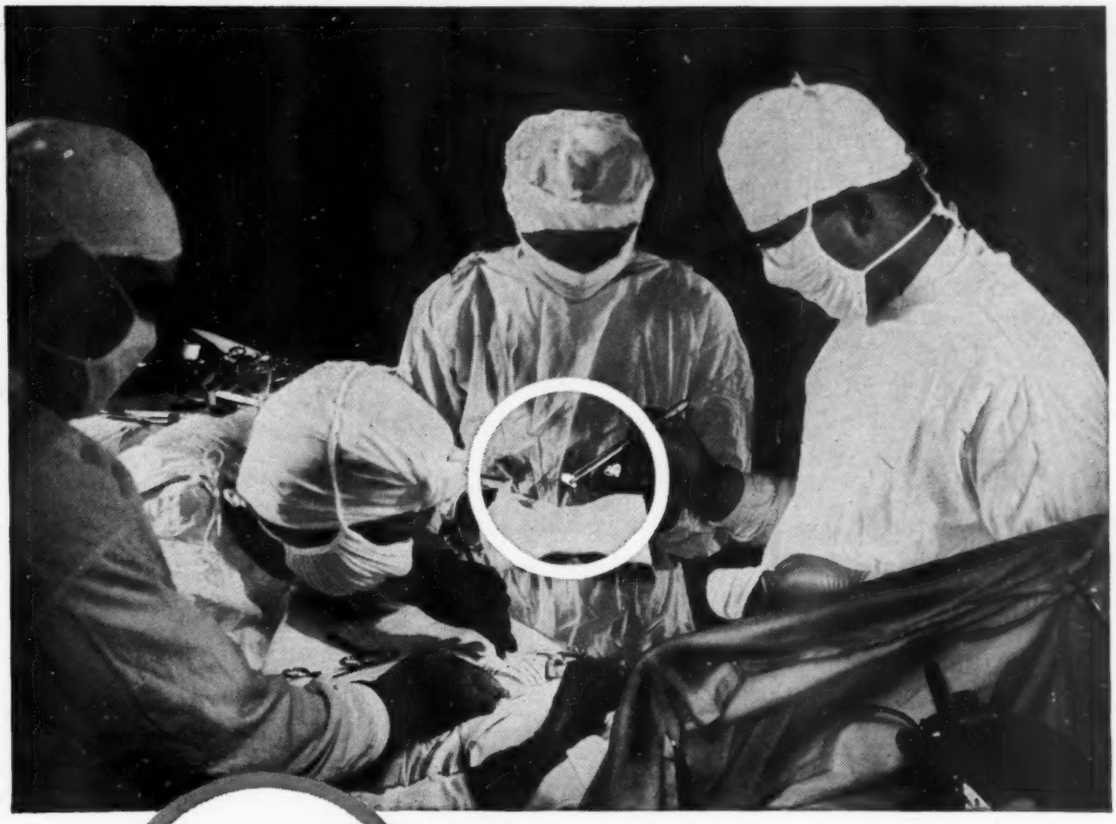
SUMMARY

A newborn infant, born with complete absence of the anus, sphincter, anal canal and rectum, was successfully operated upon via proctoplasty eighteen hours after birth, bringing down the sigmoid colon to serve as the new anal canal and rectum. The boy is now three years old and normal in every other respect. The formation of scar in the new anal canal, together with more progressive use of the gluteus maximus muscles, has effectuated very good control of bowel movements. The author has proctoscoped the boy several times during the past year, never finding evidence of the rectal valves, or so-called folds of Houston. This, together with the appearance of the intestinal anatomy at the time of operation, is the basis for the author's conviction that it is not the rectum, but rather the sigmoid colon, which is now functioning as an anal canal and rectum.

REFERENCES

1. Christopher, F. Textbook of Surgery. P. 1,608. Philadelphia, 1936. W. B. Saunders Co.
2. Davis, G. G. Applied Anatomy. P. 630. Philadelphia, 1918. J. B. Lippincott Co.
3. Lockhart-Mummery. Diseases of the Rectum and Colon. P. 605. Baltimore, 1934. William Wood & Co.
4. Rankin, Bargen and Buie. The Colon, Rectum and Anus. P. 846. Philadelphia, 1935. W. B. Saunders Co.
5. Yeomans, F. C. Proctology. P. 661. New York, 1929. D. Appleton & Co.
6. Tuttle, J. P. A Treatise on Diseases of the Anus, Rectum and Pelvic Colon. P. 963. New York, 1903. D. Appleton & Co.

Correction: In our June, 1947 issue, on page 675 in Table v, the author wishes to call attention to an item under "Radical operation. . . . (2) Total nephrectomy." In the column entitled "Result," figure five should have appeared under the subdivision "Died."



This Surgical Sponge is "human"!

It's CUTTER FIBRIN FOAM

Hemostatic agent made from human blood—
entirely homologous, non-reactive, and absorbable

Where the protection of vital anatomic structure is of primary concern to the surgeon, Cutter's Fibrin Foam acts as a highly effective, absorbable hemostatic agent. Made from *human blood*, it is entirely homologous and non-reactive.

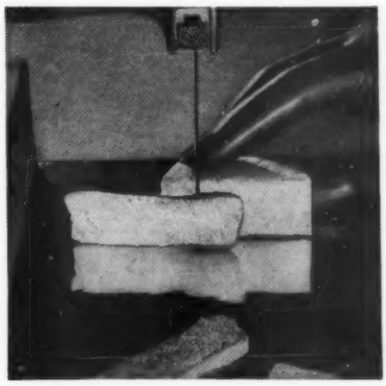
Fibrin Foam permits faster, easier technic in all surgical procedures where hemostats and sutures are impractical. It adheres rapidly, and reduces sponging time to a minimum without danger of dislodging clot. And, because it's made from human blood, Fibrin Foam may be left in place following surgery, until it is absorbed naturally during the healing process.

An outgrowth of research in plasma fractionation at the Harvard Medical School, Fibrin Foam is one of several important blood fractions that are made by Cutter. If you want more information on these products, write for Cutter's BLOOD FRACTIONS booklet.

Cutter Laboratories
Berkeley, Chicago, New York

• • •

Sponge-like Fibrin Foam is now supplied in small wafer-thin pieces for easier application to various bleeding areas.



CUTTER
Fine Biologicals and Pharmaceutical Specialties

On the Plus Values In Variety Meats

Variety meats—as the meat industry terms liver, kidney, heart, thymus (sweetbreads), and tongue—are at least as nutritionally desirable as muscle meat. In fact, in some respects certain organ meats are superior.

They provide the indispensable amino acids in the same advantageous complete assortment as muscle meat. Hence their protein is of the same high biologic value, capable of meeting every protein need of the organism. Quantitatively their protein content is approximately equal to that of muscle meat.

For hemoglobin synthesis, liver and kidney have been found superior not only to all other protein sources so far studied but also to muscle meat itself.

All organ meats are good sources of the B-complex vitamins Some of them, such as liver and kidney, are especially rich in niacin. Liver is also an excellent source of vitamin A.

Apparently the vital role these organs play in the functioning of the animal body is reflected in the valuable contribution they can make to human nutrition. Their frequent inclusion in the human dietary—during disease as well as in health—is amply justified.

The Seal of Acceptance denotes that the nutritional statements made in this advertisement are acceptable to the Council on Foods and Nutrition of the American Medical Association.

ACCEPTED COUNCIL ON FOODS AND NUTRITION AMERICAN MEDICAL ASSOCIATION

AMERICAN MEAT INSTITUTE

MAIN OFFICE, CHICAGO . . . MEMBERS THROUGHOUT THE UNITED STATES

Perandren

As time runs out, Perandren is specific in the treatment of the male climacteric. Perandren IS testosterone propionate, the most potent androgen available for intramuscular administration.

PERANDREN . . . T. M. Reg. U. S. Pat. Off.

For further information, write Professional Service Department.

CIBA PHARMACEUTICAL PRODUCTS, INC., SUMMIT, N. J.

THE NEW YORK POLYCLINIC
MEDICAL SCHOOL AND HOSPITAL
(ORGANIZED 1881)

(The Pioneer Post-Graduate Medical Institution in America.)

PROCTOLOGY AND GASTRO-ENTEROLOGY

A combined course comprising attendance at clinics and lectures; instruction in examination, diagnosis and treatment; witnessing operations; ward rounds; demonstrations of cases; pathology; radiology; anatomy; operative proctology on the cadaver.

FOR THE GENERAL PRACTITIONER

Intensive full time instruction covering those subjects which are of particular interest to the physician in general practice. Fundamentals of the various medical and surgical specialties designed as a practical review of established procedures and recent advances in medicine and surgery. Subjects related to general medicine are covered and the surgical departments participate in giving fundamental instruction in their specialties. Pathology and radiology are included. The class is expected to attend departmental and general conferences.

FOR INFORMATION ADDRESS

MEDICAL EXECUTIVE OFFICER, 345 West 50th Street, NEW YORK 19

COOK COUNTY GRADUATE SCHOOL OF MEDICINE
(In affiliation with COOK COUNTY HOSPITAL) Incorporated not for profit

Announces continuous courses

SURGERY—Two Weeks Intensive Course in Surgical Technique Starting September 22, October 20, November 17.

Four Weeks Course in General Surgery Starting September 8, October 6, November 3.

Two Weeks Surgical Anatomy & Clinical Surgery Starting September 22, October 20, November 17.

One Week Surgery of Colon & Rectum Starting September 15, and November 3.

Two Weeks Surgical Pathology Every Two Weeks.

FRACTURES & TRAUMATIC SURGERY—Two Weeks Intensive Course Starting October 6.

GYNECOLOGY—Two Weeks Intensive Course Starting September 22, October 20.

One Week Course in Vaginal Approach to Pelvic Surgery Starting September 15 and October 13.

OBSTETRICS—Two Weeks Intensive Course Starting September 8, October 6.

MEDICINE—Two Weeks Intensive Course Starting October 6.

Two Weeks Gastro-Enterology Starting October 20.

One Week Course Hematology Starting September 29.

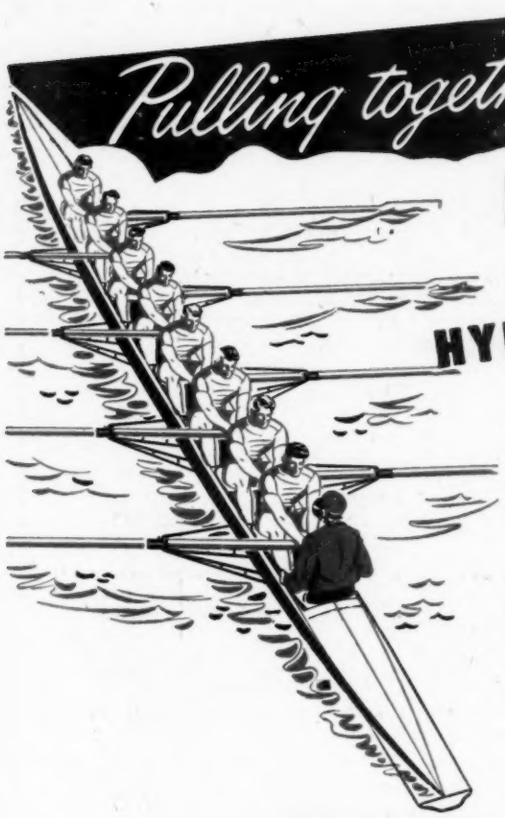
One Month Course Electrocardiography & Heart Disease Starting September 15.

DERMATOLOGY & SYPHILOLOGY—Two Weeks Course Starting October 20.

GENERAL, INTENSIVE AND SPECIAL COURSES IN ALL BRANCHES OF MEDICINE, SURGERY AND THE SPECIALTIES

TEACHING FACULTY—ATTENDING STAFF of Cook County Hospital

Address: Registrar, **427 South Honore Street, Chicago 12, Illinois**



For Speedier Recovery in HYPOCHROMIC ANEMIA

Combining the therapeutic effects of iron with adequate amounts of other essential nutrients makes for speedier and more efficient recovery in hypochromic anemia.

Frequent occurrence of multiple vitamin deficiencies in patients with hypochromic anemia makes it especially desirable to supplement specific iron medication with adequate amounts of all the lacking vitamins. Iron alone is inadequate.

The Heptuna formula is based on this rational approach to anemia therapy.

EACH CAPSULE CONTAINS:

Ferrous Sulfate U.S.P.	4.5 Grains
Vitamin A (Fish-Liver Oil)	5,000 U.S.P. Units
Vitamin D (Tuna-Liver Oil)	500 U.S.P. Units
Vitamin B_1 (Thiamine Hydrochloride)	2 mg.
Vitamin B_2 (Riboflavin)	2 mg.
Vitamin B_6 (Pyridoxine Hydrochloride)	0.1 mg.
Calcium Pantothenate	0.333 mg.
Niacinamide	10 mg.

Together with other B-complex factors from liver and yeast.

Heptuna

a **ROERIG** *preparation*

J. B. ROERIG AND COMPANY • 536 Lake Shore Drive • Chicago 11, Illinois

IODINE • Essential Ally of the Profession for

Prevention . . . Diagnosis . . . Therapy

In addition to the many Iodine specialties, the following Iodine preparations, official in United States Pharmacopœia XIII and National Formulary VIII, are widely prescribed in everyday practice:

U. S. P. XIII

CALCIUM IODOBEHENATE
CHINIOFON
CHINIOFON TABLETS
DILUTED HYDRIODIC ACID
HYDRIODIC ACID SYRUP
IODINE
STRONG IODINE SOLUTION (LUGOL'S)
IODINE TINCTURE
IODIZED OIL
IODOPHTHALEIN SODIUM
IODOPYRACET INJECTION
SODIUM IODIDE
POTASSIUM IODIDE

N. F. VIII

AMMONIUM IODIDE
FERROUS IODIDE SYRUP
IODINE AMPULS
IODINE OINTMENT
IODINE SOLUTION
PHENOLATED IODINE SOLUTION
STRONG IODINE TINCTURE
IODOCHLOROHYDROXYQUINOLINE
IODOCHLOROHYDROXYQUINOLINE TABLETS
IODOFORM
POTASSIUM IODIDE SOLUTION
POTASSIUM IODIDE TABLETS
COLLOIDAL SILVER IODIDE
SODIUM IODIDE AMPULS
THYMOL IODIDE
YELLOW MERCUROUS IODIDE
YELLOW MERCUROUS IODIDE TABLETS

NEW NAMES for IODINE TINCTURES:

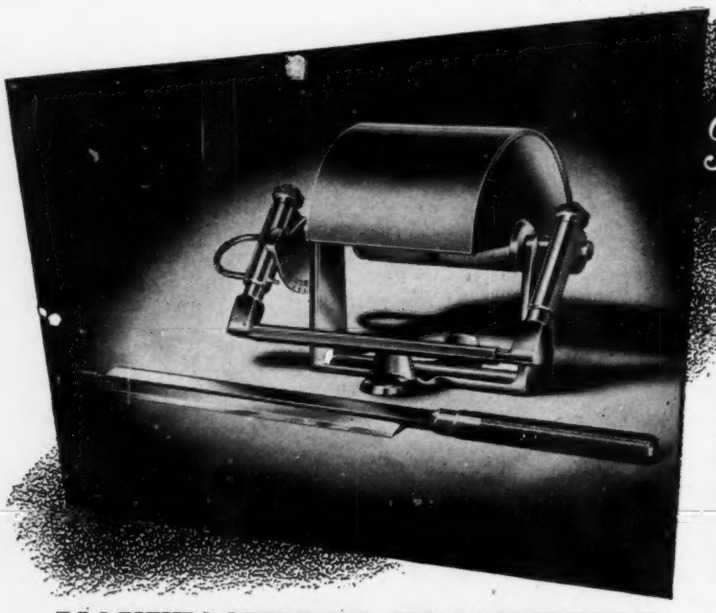
Iodine Tincture U.S.P. XIII (2%)
(Formerly official in U.S.P. XII as Mild Tincture of Iodine)

•

Strong Iodine Tincture N.F. VIII (7%)
(Formerly official in U.S.P. XII as Tincture of Iodine)

Iodine
Educational Bureau, Inc.

120 Broadway, New York 5, N. Y.

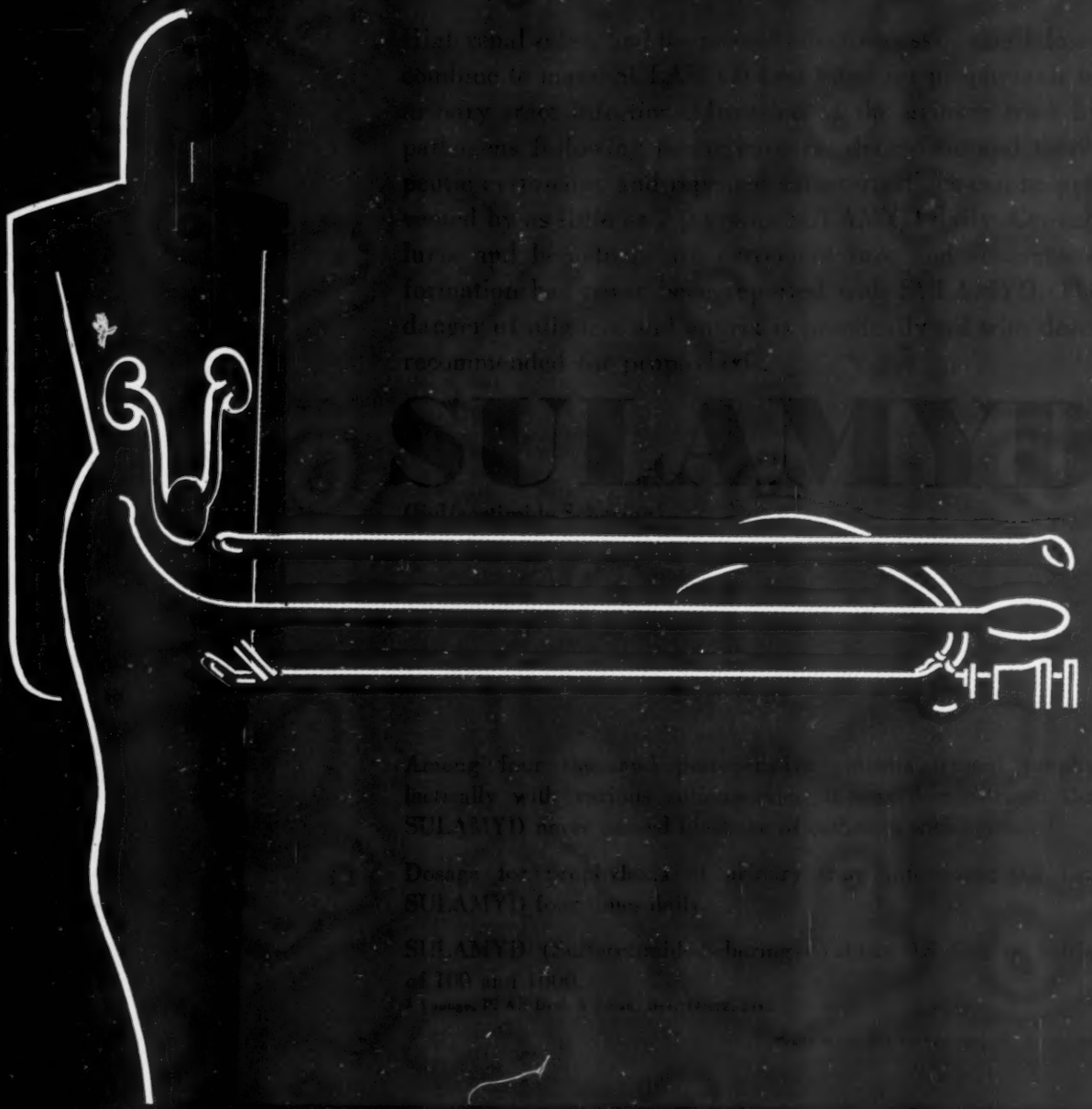


THE *Padgett-Hood* DERMATOME

By means of this unique instrument a sheet of skin of uniform thickness may be cut at a predetermined level from any area of the body as large as 4 x 8 inches (the size of the drum). Those who have used the Dermatome state that it simplifies the technique and considerably enlarges the whole field of skin grafting. The Dermatome blade may be inserted in the handle for honing the blade and also for cutting razor grafts. Rubber cement for the drum and donor area is available, extra knives are kept in stock, and a knife sharpening service is maintained. Carrying cases are available upon request.

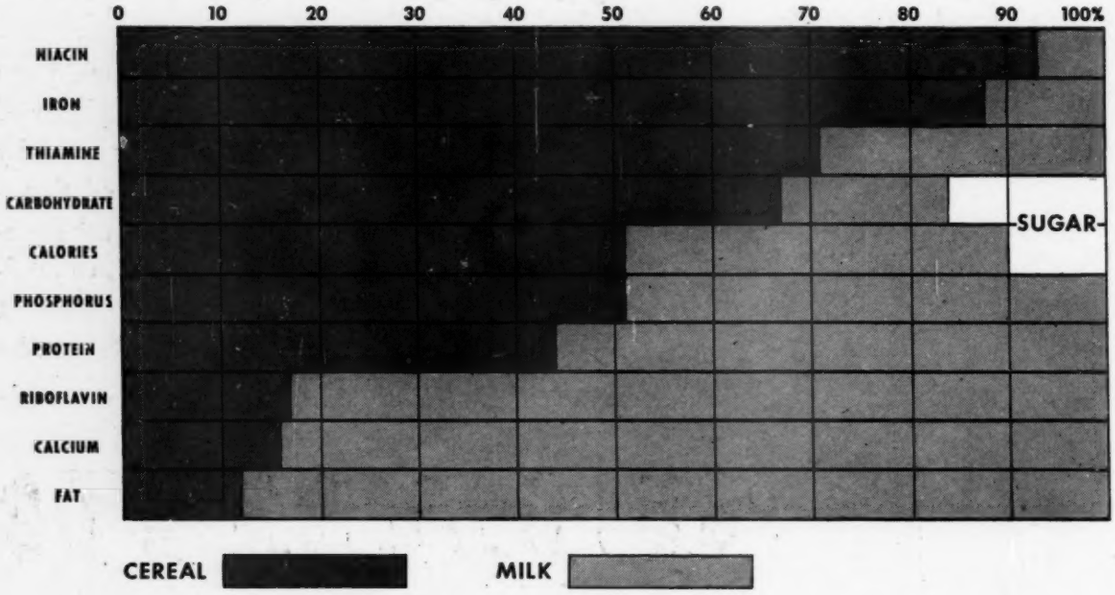
MANUFACTURED EXCLUSIVELY AND SOLD
by
KANSAS CITY ASSEMBLAGE COMPANY
609 East 17th Street • • • • • • Kansas City 8, Mo.

Best fitted for PROPHYLAXIS



SCHERING

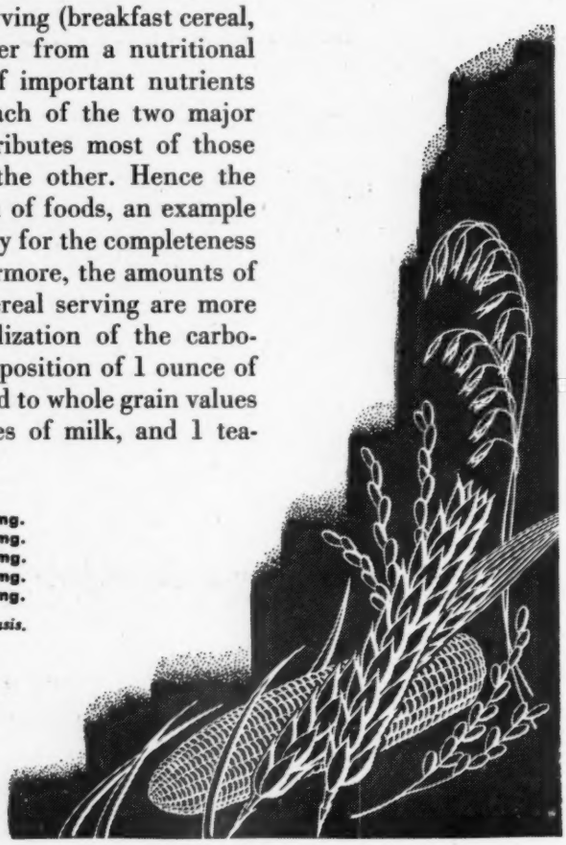
Excellent Nutritional Supplementation



The chart reproduced above illustrates the excellent manner in which the foods comprising the cereal serving (breakfast cereal, milk, and sugar) complement each other from a nutritional standpoint. It depicts the percentage of important nutrients contributed by each food. Note that each of the two major components of the cereal serving contributes most of those nutrients supplied less generously by the other. Hence the cereal serving is a balanced combination of foods, an example of the importance of selecting foods wisely for the completeness of their combined contributions. Furthermore, the amounts of B-complex vitamins contained in the cereal serving are more than adequate to permit metabolic utilization of the carbohydrates provided. The quantitative composition of 1 ounce of cereal* (whole grain, enriched, or restored to whole grain values of thiamine, niacin, and iron), 4 ounces of milk, and 1 teaspoonful of sugar is shown in the table.

CALORIES.....	202	PHOSPHORUS...	206 mg.
PROTEIN.....	7.1 Gm.	IRON.....	1.6 mg.
FAT.....	5.0 Gm.	THIAMINE.....	0.17 mg.
CARBOHYDRATE	33.0 Gm.	RIBOFLAVIN....	0.24 mg.
CALCIUM.....	156 mg.	NIACIN.....	1.4 mg.

Composite average of all breakfast cereals on dry weight basis.



CEREAL INSTITUTE, INC.

135 South La Salle Street • Chicago 3

The presence of this seal indicates that all nutritional statements in this advertisement have been found acceptable by the Council on Foods and Nutrition of the American Medical Association.

THE LANTEEN DIAPHRAGM is rigid in one plane, therefore easy to place. When largest comfortable size is fitted, if entering rim lodges against cervix, trailing rim cannot be forced into pubic arch.

***Lanteen jelly* has three important advantages:**

1. **Reliable . . . spermicidally effective.**
2. **Tenacious in its viscosity.**
3. **Non-irritating . . . Non-toxic.**

Offered only through the medical profession. Complete package sent physicians on request.

Lanteen

LANTEEN MEDICAL LABORATORIES, INC. • CHICAGO 10

Ever wish you were Aladdin?

You remember him . . .

He was the lucky fellow who found a magic lamp. It gave him everything he wished for—from diamond-crusted palaces to a sultan's daughter as his bride.

You've probably wished a lot of times for a miracle like this to happen to you. Maybe not for out-of-this-world treasures, but for something that will take care of the things that are bound to come up.

Like medical expenses, or college for the kids. Or maybe just for the nice, safe feeling it gives you to have some extra money put aside for the future.

Though no magic is involved, there is a way to give you this security. The Payroll Savings Plan. Or, if you're not eligible for the Payroll Plan but have a checking account, the new Bond-a-Month Plan.

Either way, it's almost unbelievable how quickly your money accumulates.

Where else can you get such a *safe*, generous return on your money ($4 for every $3)? It's so simple—so easy, you hardly miss the money that you're saving.

And don't forget—at the same time, you're *making more*!

Next to a magic lamp, there's no better way than this to make sure your future is secure.

Save the easy, automatic way . . . with U.S. Savings Bonds

Contributed by this magazine in co-operation with the Magazine Publishers of America as a public service.

You can't keep your hands in a glass case

...but you CAN use TRUSHAY!

TRUSHAY protected hands are soft and supple. They will appeal to fastidious patients.

More and more professional men and women are recognizing the advantages of this sensible corrective for the drying effects of frequent scrubbings. TRUSHAY does not interfere with the hygienic cleanliness produced by soap and water because it is used BEFOREHAND.

TRUSHAY contains no glycerin, is not sticky or gummy. It guards against excessive depletion of the skin's natural lubricant... aids in keeping the epidermis pliant and unbroken.

Your patients will appreciate TRUSHAY for their personal use, too. Recommend it with confidence and the assurance of their appreciation.

TRUSHAY

THE "BEFOREHAND" LOTION

A product of **BRISTOL-MYERS COMPANY, 19 West 50th Street, New York 20, N. Y.**

The combination of — **Sulfamerazine *Microcrystalline*..1.5 Gm. (22 gr.)**
Sulfadiazine *Microcrystalline*....1.5 Gm. (22 gr.)

is presented in Mer-Diazine. Equal parts of sulfamerazine and sulfadiazine have been found by Flippin et al* to lead "to a markedly decreased incidence of crystalluria compared with that observed when either compound was administered singly . . . The use of sulfonamide mixtures avoids certain disadvantages associated with the administration of sodium bicarbonate . . ."

Liquoid Mer-Diazine — presents a palatable, homogenized suspension of these two sulfonamides. The microcrystalline form in which the drugs are present assures the most rapid absorption; slow excretion of sulfamerazine makes maintenance of a suitable blood level relatively simple; both sulfas penetrate readily into ascitic, pleural and cerebrospinal fluids.
Liquoid Mer-Diazine provides convenience in administration—particularly useful in pediatrics.
Warning: Sulfadiazine and Sulfamerazine may cause toxic reactions.

Available in 4 fl. oz. and pint bottles. Samples on request.

*Flippin, H. F. and Reinhold, J. G.: Ann. Int. Med., 25:433 (Sept.) 1946.

McNEIL
LABORATORIES, INC., PHILADELPHIA 32, PENNSYLVANIA

The American Journal of Surgery

ADVERTISERS INDEX

Instruments and Apparatus

A. S. Aloe Company ..... July
American Cystoscope Makers, Inc. 5
Austenal Laboratories, Inc. 12
Bard-Parker Co., Inc. 13
Becton, Dickinson & Co. 28
Clay-Adams Co. Inc. 20
Gomco Surgical Mfg. Co. 9
J. E. Hanger, Inc. ..... July
Fred Haslam & Co. 1
The Kansas City Assemblage Co. 38
Kny-Scheerer Corp 11
Parker, White & Heyl, Inc. 13
Geo. P. Pilling & Son Co. ..... July
Propper Manufacturing Co. ..... July
Singer Sewing Machine Company 15
J. Sklar Manufacturing Co. ..... July
Wallace Orthopedic Supply Co. ..... July
Edward Weck & Co., Inc. ..... July

Sutures

The Armour Laboratories ..... *Insert Facing p. 24*
Bauer & Black 6–7
Davis & Geck, Inc. ..... *Insert Facing 2nd Cover*
J. A. Deknatel & Sons, Inc. ..... July
Ethicon Suture Laboratories 14
Gudebrod Brothers Silk Co. 10

Pharmaceuticals

Abbott Laboratories 25
American Hospital Supply Corp 27
The Armour Laboratories ..... *Insert Facing p. 24*
Baxter Laboratories 27
Bristol Laboratories 8
Bristol-Myers Company 43
Ciba Pharmaceutical Products, Inc. ..... *35, Back Cover*
Chatham Pharmaceuticals, Inc. 31
Commercial Solvents Corporation 24
Cutter Laboratories 23, 33
E. Fougera & Co. Inc. 30
International Pharmaceutical Corp 22
Iodine Educational Bureau, Inc. 38
Lanteen Medical Laboratories, Inc. 41
The Lavoris Company ..... July
Eli Lilly and Company ..... July
The S. E. Massengill Company ..... July
Merck & Company ..... July
McNeil Laboratories, Inc. 44
The National Drug Co. ..... July
Nutrition Research Laboratories ..... July
Ortho Pharm. Corp ..... July
Parke, Davis & Co. ..... July
J. B. Roerig and Company 37
Schering Corporation 39
Sharp & Dohme, Inc. ..... July
E. R. Squibb & Sons 21
Frederick Stearns & Company 29
The Upjohn Company ..... July
Wm. R. Warner & Co., Inc. ..... July
Winthrop Chemical Co., Inc. 2

Hospital Supplies

A. S. Aloe Company ..... July
American Hospital Supply Corp. 27
Becton, Dickinson & Co. 28
Cutter Laboratories 23, 33
Fred Haslam & Co., Inc. 1
Johnson & Johnson 32
Macalaster Bicknell Company 19
Mallinckrodt Chemical Works 18
Owens-Corning Fiberglas Corp ..... July
The Pioneer Rubber Co. ..... July

Books & Magazines

Washington Institute of Medicine ..... July

Post-Graduate Instruction

Cook County Grad. Sch. of Med. 36
N. Y. Polyclinic Med. School 36

Foods

American Meat Institute 34
Cereal Institute Inc. 40
National Confectioners' Assn. 26
The Wander Company ..... July

Miscellaneous

The American Journal of Surgery 16–17
U. S. Treasury 42

Pollen Count of City Air*

Los Angeles	108
Denver	1126
Washington, D. C.	820
Atlanta	697
Boston	359
Detroit	1928
St. Louis	[illegible]
Chicago	[illegible]
Des Moines	5228
New Orleans	796
Omaha	4159
New York	585
Portland, Oregon	36
Philadelphia	1257
Dallas	2077

*Aerobe Function, Feinberg, S. M. Second Edition 1946 Year Book Publishers, Chicago

Pyribenzamine

HYDROCHLORIDE

CIBA

In seasonal hay fever Pyribenzamine has provided effective symptomatic relief in 82 per cent of patients.* It has also been successfully employed in urticarial dermatoses, acute and chronic atopic dermatitis and certain allergic drug reactions. The comparatively low incidence of side effects permits adequate doses in cases where other antihistaminics have not been tolerated.

*Feinberg, J.A.M.A. 132:702, 1946

PYRIBENZAMINE ® (brand of tripelennamine)

For further information, write Professional Service Division

CIBA PHARMACEUTICAL PRODUCTS, INC., SUMMIT, NEW JERSEY